In the United States Court of Federal Claims

OFFICE OF SPECIAL MASTERS
No. 14-254V
(to be Published)

KAILEY JOHNSON,	*	
	*	
	*	Special Master Corcoran
Petitioner,	*	
	*	Dated: March 23, 2018
v.	*	
	*	Entitlement Decision; Human
	*	Papillomavirus ("HPV") Vaccine;
SECRETARY OF HEALTH AND	*	Postural Orthostatic Intolerance
HUMAN SERVICES,	*	Syndrome ("POTS"); Chronic
	*	Fatigue Syndrome.
Respondent.	*	
	*	

Sean F. Greenwood, The Greenwood Law Firm, Houston, TX, for Petitioner.

Ilene C. Albala, U.S. Dep't of Justice, Washington, DC, for Respondent.

DECISION[1]

On March 31, 2014, Charmaine Johnson filed a petition seeking compensation under the National Vaccine Injury Compensation Program ("Vaccine Program")[2] on behalf of her then-minor daughter, Kailey Johnson, now the named petitioner.[3] Ms. Johnson alleges that she suffers from a variety of injuries, including leg pain, joint pain, difficulty breathing, eye drooping, and

[1] This Decision has been designated "to be published," which means I am directing it to be posted on the Court of Federal Claims's website, in accordance with the E-Government Act of 2002, 44 U.S.C. § 3501 (2012). As provided by 42 U.S.C. § 300aa-12(d)(4)(B), however, the parties may object to the Decision's inclusion of certain kinds of confidential information. Specifically, under Vaccine Rule 18(b), each party has fourteen days within which to request redaction "of any information furnished by that party: (1) that is a trade secret or commercial or financial in substance and is privileged or confidential; or (2) that includes medical files or similar files, the disclosure of which would constitute a clearly unwarranted invasion of privacy." Vaccine Rule 18(b). Otherwise, the whole Decision will be available to the public. *Id*.

[2] The Vaccine Program comprises Part 2 of the National Childhood Vaccine Injury Act of 1986, Pub. L. No. 99-660, 100 Stat. 3758, codified as amended at 42 U.S.C. §§ 300aa-10 through 34 (2012) [hereinafter "Vaccine Act" or "the Act"]. Individual section references hereafter will be to § 300aa of the Act (but will omit that statutory prefix).

[3] The caption was changed after Ms. Johnson turned 18.

fatigue, and/or postural orthostatic tachycardia syndrome ("POTS"), as a result of receiving the third dose of the human papillomavirus ("HPV") vaccine on February 16, 2011.

An entitlement hearing was held in the case on October 3 and 12, 2017. Now, having considered the record, the parties' filings, and the testimony from the hearing, I find that Petitioner has not successfully carried her burden of proof. As discussed in more detail below, assuming the HPV vaccine could cause POTS or any of her other claimed injuries, onset of any symptoms that arguably might be related to POTS occurred far too long after the relevant vaccine administration date to find the temporal gap medically appropriate. Petitioner otherwise did not successfully establish that the HPV vaccine could cause POTS or any similar symptoms of orthostatic intolerance.

I. Factual Background

Vaccination and Doctor's Visits in 2011

Ms. Johnson received her third dose of HPV vaccine on February 16, 2011, when she was 11. Ex. 2 at 44. Approximately six weeks later (with no intervening medical records memorializing any response or reaction to this vaccination), Petitioner saw Dr. Robert Gilbert, D.O., on March 29, 2011, for a cough, but complained of no other symptoms (and specifically denied dyspnea (shortness of breath). Ex. 3 at 26-29. A lung exam was normal, and her throat and sinuses were red. Petitioner was diagnosed with a viral upper respiratory infection, and prescribed an oral antibiotic. *Id.* at 26.

On May 19, 2011 – now three months after receiving the HPV vaccine, and seven weeks from the aforementioned March visit – Petitioner returned to Dr. Gilbert complaining of two days of a worsening, productive cough, along with chest pain. Ex. 3 at 20-23. A chest X-ray indicated a right lower lung infiltrate. *Id.* at 23. "Change of seasons" was identified as a trigger – suggesting that allergies were suspected as a cause. *Id.* at 20. Her exam was otherwise normal, making no mention of shortness of breath or fatigue, and she was diagnosed with acute bronchitis and (as with her March 2011 visit) treated with antibiotics. *Id.* at 22.

The next month, on June 11, 2011, Ms. Johnson returned to Dr. Gilbert. Ex. 3 at 14-18. She now (and for the first time in the medical records relevant to this claim) reported shortness of

breath "on exertion." *Id.* at 14. The description of Petitioner's onset of symptoms is somewhat confused in this record. Thus, the record suggests her shortness of breath began only three days before – but also states that it was "gradual," and followed a respiratory infection from five weeks before (most likely the May 2011 bronchitis diagnosis). *Id.* However, Petitioner also described her shortness of breath as mild and intermittent, and denied feeling lightheaded. *Id.* An exam, including a lung exam, was normal. *Id.* at 17. The assessment was a resolving upper respiratory infection that would be monitored going forward. *Id.* at 16-17.

Three months passed before Ms. Johnson returned to a physician. On September 11, 2011, she went back to see Dr. Gilbert. Ex. 3 at 8-11. She again reported experiencing mild occasions of shortness of breath beginning two days before. *Id.* at 8. However, Petitioner also complained of a sore throat, and testing revealed she was positive for strep throat. *Id.* at 9, 11. A chest X-ray showed haziness in her right lower lung, but a chest CT scan performed two days later, on September 13, 2011, was negative for any acute or active problem. Ex. 3 at 6. Ms. Johnson received an antibiotic prescription for her strep throat. *Id.* at 10-11. There are no additional medical records for the remainder of 2011 suggesting that these symptoms were ongoing or progressive.

2012 and More Severe Symptoms

On March 27, 2012 (now a year since Petitioner's receipt of the final dose of HPV vaccine), Ms. Johnson again visited Dr. Gilbert, complaining of a sore throat for one week and also a headache. Ex. 3 at 1. She was diagnosed with a viral infection, pharyngitis, and headache. Testing for strep throat and mononucleosis was negative. *Id.* at 3-4. This record makes no reference to shortness of breath or lightheadedness, and it does not allude to any of Petitioner's various visits to Dr. Gilbert in 2011, or the symptoms described at those visits.

Almost five weeks later, however, Petitioner experienced a new symptom distinct from what she had previously reported to her medical providers. Ms. Johnson saw Diane Dietlein, M.D., at Children's Hospital of Alabama in Pinson, Alabama, on May 4, 2012, complaining of worsening headaches over the prior two weeks which could be alleviated with over-the-counter pain medication but did not completely resolve. Ex. 2 at 38-39. In particular, the record from this visit stated that Petitioner reported a history of normal sinus headaches, but had recently experienced two weeks of more severe pain – particularly located in her right eye, with her eyelid drooping, or

ptsosis (although Petitioner denied experiencing any resulting visual changes). *Id.* at 38. Dr. Dietlein's exam of Ms. Johnson was notable for mild ptosis of the right eye. A head CT was ordered (in part to rule out a tumor), and Petitioner was referred to an ophthalmologist. *Id.* at 41. That scan, however, was largely deemed normal, and detected no intracranial masses or ongoing inflammation. *Id.* at 30-31.

Ms. Johnson went to ophthalmologist Dr. Martin Cogen on May 14, 2012, at the Callahan Eye Foundation Hospital in Birmingham, Alabama, for an evaluation of her overall vision. Ex. 8 at 8. Dr. Cogen recommended that Petitioner be screened for myasthenia gravis[4], given the constellation of symptoms she complained of, and referred her to a neuro-ophthalmologist, Dr. Michael Vaphiades. *Id.* at 7. By the time Petitioner saw Dr. Vaphiades on May 25, 2012, she was experiencing worsened symptoms, including fatigue, more shortness of breath (particularly after exertion), and pain. *Id.* at 1-3. Dr. Vaphiades confirmed with an exam that Ms. Johnson's eyes were healthy and her vision normal, and indicated that she had not tested positive for any antibodies associated with myasthenia gravis, but nevertheless noted that (in part because the Johnsons were about to move from Alabama to Texas) the consensus between the Johnson family and the relevant treaters was for Petitioner to be admitted to Children's Hospital ER in Birmingham in order to fully rule out myasthenia gravis. *Id.* at 2.

Ms. Johnson was thereafter admitted as an inpatient on May 25, 2012, and discharged the next day. Ex. 2 at 10-11, 18-23. According to the history obtained by neurologist Leon Dure, M.D., Petitioner had been experiencing daily headaches in her right eye for approximately six weeks, or since early April. *Id.* at 6. She also felt sickly overall and tired. A brain MRI performed at that time, however, was normal, except for a small cyst-appearing area that was thought to be incidental. *Id.* at 25-27. After consideration of all of the above, Dr. Dure could only confirm Petitioner's ptosis, and noted that he deemed this an "unusual presentation for myasthenia," but that it could nevertheless be associated with a cerebral aneurysm (although the MRI results tended to make that unlikely as well). *Id.* at 9.

[4] Myasthenia gravis is a disorder of neuromuscular transmission marked by fluctuating weakness and fatigue of certain voluntary muscles, including those innervated by brainstem motor nuclei. *Dorland's Illustrated Medical Dictionary* 1214 (32nd ed. 2012) [hereinafter *Dorland's*].

Upon discharge, Dr. Dure referred Ms. Johnson to another neurologist in order to fully rule out myasthenia gravis by performing a "Jolly test."[5] Ex. 2 at 10. Neurologist Pierre Fequiere, M.D., subsequently performed EMG/NCV studies on Petitioner's right ulnar, facial and accessory nerves on May 29, 2012. *Id.* at 1-2. The NCV studies were normal, and an EMG of the right upper extremity and face was also normal. *Id.* It does not appear thereafter that any of Ms. Johnson's treaters again raised the possibility that her symptoms reflected myasthenia gravis or anything else so severe.

Five months later, Ms. Johnson was seen by Majorie Quarles, M.D., of Texas Children's Pediatrics in Conroe, Texas, on November 2, 2012, complaining of ongoing difficulties breathing that were not effectively remedied by asthma medication. Ex. 4 at 107.[6] The record notes that Petitioner's shortness of breath had been "off and on" for two years (a period of time which, if literally true, would place onset of her symptoms *before* she received the vaccination at issue in February 2011) but had worsened, along with episodes of chest pain that felt like intense heartburn. *Id.* Dr. Quarles did not propose an etiology for Petitioner's shortness of breath, but wrote that "there is likely an exercise-induced asthma component since we have seen some improvement in that respect." *Id.* at 108. A few weeks later, on November 26, 2012, Petitioner saw a different pediatrician at the same location, Dr. Richard Calvin, complaining of a cough and sore throat – but not the shortness of breath she had reported to Dr. Quarles. *Id.* at 104. Petitioner's chest exam was clear, and she was diagnosed with a cough, cough-equivalent asthma, and pharyngitis. *Id.* at 105.

Treatment in 2013

Over the next two years, Petitioner saw a number of treaters in an effort to address symptoms similar to those addressed above, but explanations for her condition were elusive. Thus, on January 11, 2013, Ms. Johnson saw pulmonologist Michelle Mann, M.D., complaining of exercise intolerance. Ex. 4 at 100-02. Her exam was mostly normal (and in particular denied

[5] A Jolly test refers to "a sequence of repetitive nerve stimulation (RNS) studies specifically designed to look for neuromuscular junction disease" and is helpful in diagnosing myasthenia gravis. *Myasthenia Gravis*, Yale Sch. of Med., https://medicine.yale.edu/neurology/patients/neuromuscular/mg.aspx (last accessed on Mar. 6, 2018).

[6] This record references an earlier treatment visit complaining of shortness of breath to the same provider the month before, but the relevant document substantiating the earlier visit does not appear to have been filed.

dyspnea), and was diagnosed with asthma. Ex. 4 at 102. Dr. Mann also indicated that "work up this far most suggestive of *weakness* as cause of exercise intolerance and shortness of breath given abnormal pulmonary mechanics. Unclear etiology of weakness." *Id.* (emphasis added).

The following month, Petitioner was hospitalized for pneumonia on February 7, 2013, at the pediatric intensive care unit at Texas Children's Hospital. Ex. 4 at 83, 94-99. According to an attending physician's note, Ms. Johnson was admitted for acute respiratory disease, decrease in size of meals, drooling, dry cough, and change in quality of voice that was concerning for evolving bulbar weakness and decreased strength. *Id.* at 88. A history given to Petitioner's emergency providers stated that she had been well until April 2011, when she developed pneumonia and was treated with antibiotics. She recovered slowly over the next four to six months but never returned to baseline. *Id.* at 84. The history also emphasized the extent to which Petitioner's unexplained weakness and shortness of breath was associated with physical activity, and the fact that she had lost ten pounds over the prior four months. *Id.* During the hospitalization, she received oxygen and antibiotics and was later discharged February 12, 2013. *Id.* at 74-77. Neurologist Amitha Ananth, M.D., consulted and recommended additional testing, noting the concern from 2012 for myasthenia gravis. *Id.* at 82.

Two weeks after this hospitalization, Petitioner saw neurologist Garrett Burris, M.D., on February 25, 2013. Ex. 4 at 69-73. The history Dr. Burris received again placed onset of Petitioner's symptoms as the spring of 2011, and emphasized her ongoing shortness of breath, weakness, and now "dizziness when she stands up." *Id.* at 70. Dr. Burris's examination, however, revealed "close to normal, if not normal, strength and reflexes," although he also noted the possibility that her episodes of weakness and dizziness had a "postural trigger." *Id.* at 73.

Later that summer, on July 15, 2013, Ms. Johnson was taken to a pediatric neurologist, Timothy Lotze, M.D. Ex. 4 at 53-57. Dr. Lotze's history noted, among other things, that Petitioner had undergone a muscle biopsy in March that was unremarkable, and that since that time she had "overall been healthy," other than some ongoing fatigue along with intermittent leg pains. *Id.* at 53. She had (as noted above) received a negative work-up for myasthenia gravis, and other studies for metabolic myopathy were normal. Her neurological exam was normal, and Dr. Lotze observed that "I cannot find a neurological condition to explain her complaints of

muscle aches and joint pains." *Id.* at 57. He also noted that Mrs. Johnson expressed to him the opinion that Petitioner's symptoms were related to the Gardasil vaccine, but did not make any further comment. *Id.*

Petitioner returned to Dr. Quarles on August 7, 2013, reporting ear pain, plus ongoing weakness and leg pain of unknown etiology. Ex. 4 at 50. Mrs. Johnson expressed the concern that no diagnosis had been made to explain the cause of her daughter's symptoms, and raised again "the possibility of association with Gardasil administration," adding that the Johnsons claimed familiarity with other young women who had experienced the same purported reaction. *Id.* Dr. Quarles found nothing specifically wrong after examination, and proposed that Petitioner consider seeing a rheumatologist. *Id.* at 51.

Later that month, on August 21, 2013, Petitioner saw Amber Yates, M.D., a hematologist, expressing concerns about a low white blood cell count that had been discovered by a wellness treater she had been seeing.[7] Ex. 4 at 46. Dr. Yates also was informed of Mrs. Johnson's view that the HPV vaccine was the source of Petitioner's symptoms, and was told that "less than two months after [Petitioner] received it she began to have joint pain," plus ptosis six weeks later (although as the record indicates, it did not begin until nearly a year after receipt of the last HPV dose). A follow-up white blood cell count was normal, and Dr. Yates characterized any low white blood cell counts Petitioner had experienced as likely the product of her "chronic medical illness," although so mild that she was not recommended for additional hematology follow-up visits. *Id.* at 48-49.

Ms. Johnson next had a rheumatology consultation with Anna Gironella, M.D., on October 18, 2013. Ex. 4 at 17. She provided a history of ongoing weakness and associated symptoms since receiving the third HPV vaccine dose, similar to that given to other treaters in 2013. *Id.* A physical exam was normal, however, including normal neurologic, muscular, and respiratory work-ups. As a result, Dr. Gironella assessed the Petitioner as not suffering from any autoimmune inflammatory condition, whether lupus, dermatomyositis, or a mixed connective

[7] *See* Ex. 4 at 1-11 (testing records from Petitioner's visits with Dr. Mila McManus at Woodlands Institute for Health and Wellness). Dr. Lotze also referenced treatments Petitioner received from a similar institution (perhaps the same one, although incomplete records of these particular treatments were filed), where Petitioner was to undergo "detoxification" as well as receive screening for "heavy metals." Ex. 4 at 53.

tissue disease. *Id.* at 40.

POTS Diagnosis and Tilt Table Test

Even after this case's filing in 2014, Petitioner and her family continued to seek an explanation for her symptoms. To that end, they consulted by telephone with Dr. Svetlana Blitshteyn, a neurologist with a demonstrated expertise in autonomic dysfunction such as POTS.[8] The Johnsons first spoke to Dr. Blitshteyn on July 29, 2015, providing her a history consistent with what they had given to other providers (and emphasizing their view that Petitioner's shortness of breath and weakness began a few weeks after receipt of the third HPV vaccine dose). Ex. 15 at 1. After reviewing the records provided to her, Dr. Blitshteyn proposed POTS or some other autonomic disorder as a potential diagnosis, and that it was at least temporally associated with the relevant HPV vaccine dose. *Id.* at 2. She proposed, however, a tilt table test (in which a patient lies flat on a table, which is elevated to measure the tested individual's change in blood pressure) to confirm the diagnosis.[9] *Id.* A little more than a month later, the Johnsons spoke with Dr. Blitshteyn a second time. *See* Record, dated September 2, 2015 (filed as Ex. 15 at 4-6). The contents of Dr. Blitshteyn's write-up and evaluation were largely the same as the July record, and again noted that a tilt table test could confirm a POTS diagnosis. *Id.*

Thereafter, and while this case was pending, I proposed that Petitioner obtain a tilt table test, assuring her that because such a test would be useful in resolving her claim, its cost could be reimbursed as part of an attorney's fees award in this matter. *See* Order, dated August 9, 2016 (ECF No. 47). Petitioner did so on September 16, 2016, at Children's Memorial Hospital in Houston, Texas, obtaining a result that the doctor performing the test deemed evidence of "mild

[8] Dr. Blitshteyn has previously submitted expert reports and testified in multiple Vaccine Program cases where petitioners allege a vaccine-induced POTS injury or an HPV vaccine-induced injury. *See, e.g.*, *Rivera v. Sec'y of Health & Human Servs.*, No. 15-487V, 2017 WL 2460690 (Fed. Cl. Spec. Mstr. Apr. 20, 2017); *Martin v. Sec'y of Health & Human Servs.*, No. 14-325V, 2016 WL 4437961 (Fed. Cl. Spec. Mstr. July 25, 2016); *Turkupolis v. Sec'y of Health & Human Servs.*, No. 10-351V, 2014 WL 2872215 (Fed. Cl. Spec. Mstr. May 30, 2014).

[9] A tilt table test is used to evaluate syncope by measuring heart rate and blood pressure in response to the body's change in position. *Tilt Table Test*, Mayo Clinic, https://www.mayoclinic.org/tests-procedures/tilt-table-test/about/pac-20395124 (last accessed Mar. 6, 2018). During the test, the patient begins by lying flat on a table for around 15 minutes. *Id.* The table is then quickly tilted upright to change the body's position from lying down to standing up. *Id.* The table generally remains upright for 45 minutes to allow the doctor to monitor the patient's cardiovascular response. *Id.*

to moderate autonomic dysfunction." *See* Ex. 19 (filed as ECF No. 52-1). Petitioner did not, however, obtain any supplemental reports or treater views interpreting the results, from Dr. Blitshteyn or anyone else. *See* Status Report, dated October 21, 2016 (ECF No. 53).

II. Witness Testimony

A. *Kailey Johnson*

Petitioner was the first fact witness to testify in this action. *See* Tr. at 182-94. She began by discussing her childhood leading up to vaccination, describing her early years as "pretty normal." *Id.* at 183. She participated in a number of athletic activities, including softball and basketball. *Id.* at 183-84. Apart from a cold (or something similar), Ms. Johnson stated that she did not have any medical problems prior to receiving the third HPV vaccine dose in February 2011. *Id*. at 184.

Ms. Johnson denied having any immediate adverse reaction to the HPV vaccine (including lightheadedness or fainting), although she recalled that the actual administration of the vaccine was painful. Tr. at 184-85. Thereafter, however, she began to notice adverse symptoms (including joint and leg pain, and concerns relating to "falling behind in [sports] workouts") between April and May 2011. *Id*. at 185. Such concerns were not present when she saw Dr. Gilbert in March of that same year to treat a cold. *Id.* She started to notice her symptoms more in April 2011, when she participated in a tornado relief effort in Tuscaloosa, Alabama. *Id.* at 186-87. At that time, she remembered being generally tired, and having to "sit down a lot" during the entire trip. *Id.* She contemporaneously informed her mother about the symptoms she was experiencing. *Id.* at 187.

Ms. Johnson testified that such symptoms continued through the 2011 summer and into the new school year. Tr. at 187. She continued to struggle with keeping up in basketball practice due to the fatigue she felt on exertion, and eventually quit the team. *Id.* Her course of symptoms worsened around the time of her family's move to Texas in 2012. *Id.* at 188-89. She now began experiencing problems concentrating in school, and started to miss classes. *Id.* at 190. She would constantly feel "really tired" and need extra sleep to regain her energy. *Id.*

Ms. Johnson also recalled the day she presented for the tilt table test in September 2016. At this time, she felt normal during the test, apart from some occasional tightening in her chest.

Tr. at 191. However, later in her testimony, she stated that she did feel lightheaded or "a little spotty" during the testing, but noted she did not complain because she felt this way generally when she stood up during her everyday activities. *Id.* at 192. Following the tilt table test and a change to her medication, she began to feel much better, and with that her feelings of faintness after standing subsided. *Id.* at 192-93.

B. *Charmaine Johnson*

Petitioner's mother, Mrs. Charmaine Johnson, testified about her daughter's health history and symptomology course following her receipt of the third HPV vaccine. *See* Tr. at 146-82. Mrs. Johnson described her daughter as a happy, healthy, "easy to raise child," who was a good student with many sports and extracurricular activities. *Id.* at 147. She accompanied Petitioner to the appointment where she received her third round of the HPV vaccine, and observed no immediate, adverse reaction to it. *Id.* at 148. She did not display any symptoms relevant to the claim herein at the March 2011 doctor's visit, such as shortness of breath. *Id.* at 149. However, by April 2011 - two months following her third HPV vaccine – Petitioner began complaining of joint and leg pain, as well as difficulty taking deep breaths. *Id*. at 149, 151. Mrs. Johnson characterized this time as when Petitioner first experienced the symptoms relevant to her alleged vaccine injury. *Id.* at 181.

Mrs. Johnson observed Petitioner's symptoms become more severe in May 2011. Tr. at 152. During this time, Ms. Johnson described Petitioner as feverish and "much sicker, in bed, [and] not able to go to school." *Id.* Petitioner was diagnosed with bronchitis, and Mrs. Johnson recalled that her daughter had trouble breathing during the visit and appeared "full in her chest." *Id.* at 154. Although the medical record from the May 19th appointment states that symptoms had started two days prior, Mrs. Johnson interpreted the doctor's note to mean actually that the symptoms had become *progressively worse* over the previous two-day period – not that they began two days before. *Id.* at 152-53. Mrs. Johnson next recalled taking Petitioner back to the doctor on June 11, 2011. *Id.* at 154-55. Petitioner was still experiencing adverse symptoms (including droopiness, lethargy, and fatigue). *Id*. at 155. She disputed the accuracy of medical records characterizing these symptoms as mild, maintaining instead that they were far more severe, although they were progressing in only a gradual manner. *Id.* at 156, 160-61.

By the time school started in August, Petitioner's complaints concerning shortness of

breath had worsened, and she became unable to participate in school sports due to leg pain and respiratory problems. Tr. at 157, 161. In Mrs. Johnson's view, her symptoms were now progressive in character (and she disputed other record assertions about symptoms beginning only a few days prior, such as stated in the record from Petitioner's September 2011 doctor's visit). *Id.* at 159-60. By 2012, Petitioner's increasingly worse symptoms (in particular, headaches) resulted in her hospitalization in order to rule out myasthenia gravis – and even if that diagnosis was then discounted, Mrs. Johnson found it frustrating that treaters could not figure out what was wrong with Petitioner. *Id.* at 162-63.

Over the next three years, Mrs. Johnson testified, the Johnson family obtained a variety of potential explanations for Petitioner's symptoms (including asthma, pneumonia, bronchitis, brain tumor, brain aneurysm, and myasthenia gravis). Tr. at 168. Eventually, Petitioner's weakness, "brain fog," and sleepiness were severe enough to limit her ability to attend high school due to absences. *Id.* at 169-70. Her symptoms did, however, seem to "level[] off" for the remainder of 2014-2015. *Id.* at 170.

Mrs. Johnson also provided some details about Petitioner's consultation with Dr. Blitshteyn and her proposed POTS diagnosis. Tr. at 171-72. Dr. Blitshteyn also recommended that Ms. Johnson request that Kailey be prescribed certain medication, including Amitriptyline and Florinef.[10] *Id.*at 172. And Mrs. Johnson testified that she attended the tilt table test for her daughter in September 2016. *Id.* at 174. At this time, Petitioner expressed few physical complaints during the procedure, apart from experiencing a "little chest pain" – something that Mrs. Johnson said surprised the testing physician, who observed a large heart rate increase of 40 beats per minute. *Id.* at 176. Since Petitioner was prescribed Florinef, she has experienced some improvement in how she feels. *Id.* at 177.

C. *Brady Johnson*

Mr. Brady Johnson, Petitioner's father, also testified at hearing. His testimony largely mirrored that of her mother's statements, and included an overall view of his daughter's health course following her vaccination. *See* Tr. at 194-201. According to Mr. Johnson, the Petitioner

[10] According to Dr. Blitshteyn's notes, she prescribed Amitriptyline for "headache prevention and widespread body pain," and Florinef for "volume expansion." Ex. 15 (ECF No. 34-1) at 5.

was an active child who participated in a number of activities, including basketball, and was very successful overall. *Id.* at 195-96. Mr. Johnson first began to notice a change in Petitioner's health when she was in the sixth grade, specifically during basketball tryouts in fall 2011, when she started to feel short of breath and display lethargy when exerting herself physically. *Id.* at 196-97. Although Mrs. Johnson attended the majority of Petitioner's doctor's appointments, he was aware of the nature of her symptoms, and was frustrated they could not be explained. *Id.* at 198-99. He did, however, notice improvement after her POTS diagnosis and change in medication. *Id.* at 199-200.

III. Expert Testimony

A. *Dr. Yehuda Shoenfeld*

Dr. Shoenfeld filed three expert reports in this case and testified at hearing. *See* Expert Report, dated September 6, 2015, filed as Ex. 49 (ECF No. 84-16) ("Shoenfeld First Rep."); Expert Report, dated March 31, 2016, filed as Ex. 44 (ECF No. 84-11) ("Shoenfeld Second Rep.")[11]; Expert Report, dated August 30, 2017, filed as Ex. 34 (ECF No. 84-1) ("Shoenfeld Third Rep."); Tr. at 5-138. He provided the opinion that Ms. Johnson suffered from POTS as a result of receiving the third HPV vaccine. *Id*. at 8, 11.

Dr. Shoenfeld, an internist and clinical immunologist, identifies himself as heading the Center for Autoimmune Diseases, which he founded at the Sheba Medical Center in Israel. Shoenfeld First Rep. at 1; Tr. at 7. He also holds the Laura Schwarz-Kipp Chair for Research of Autoimmune Diseases at Tel Aviv University. Shoenfeld First Rep. at 1. His experience focuses on autoimmune and rheumatic diseases, and he has published many peer-reviewed papers in journals and books on these topics. *Id.* He is on the editorial board of 32 journals in the field of autoimmunity, and regularly partakes in speaking engagements at conferences centered on autoimmune issues. *Id*. However, Dr. Shoenfeld lacks specialized expertise in POTS or POTS-

[11] Earlier in the case, much of Dr. Shoenfeld's theory relied heavily on the concept that an aluminum-derived adjuvant contained in the vaccine was a mechanism for the autoimmune process that he proposed was the cause of Ms. Johnson's POTS. However, in the course of the matter's adjudication, I pointed out to the Petitioner that this theory (referred to as "autoimmune syndrome induced by adjuvants," or "ASIA") had been rejected several times in the Program in other cases as scientifically unreliable, and I was not disposed to accepting it myself. *See* Order, dated January 8, 2016 (ECF No. 40). Petitioner thereafter opted to pursue her claim without relying on ASIA as an explanatory mechanism, and Dr. Shoenfeld at hearing avoided embracing it (at least openly). *See* Tr. at 57-58, 77-78.

related diseases (or pediatric diseases), is not himself a pediatrician, and has no identified history of treating or diagnosing pediatric patients with any such illnesses. *Id.* at 105.

Dr. Shoenfeld described POTS as an "inadequate reaction to the change of position" -- for example, going from a lying down position to standing. Tr. at 91. POTS is properly classified as a "dysfunction of the autonomic system," which can result from dysregulation of the blood vessels responsible for adjusting the heart rate when the body changes position. *Id.* at 24. According to Dr. Shoenfeld, patients suffering from POTS typically experience an increased heart rate, accompanied by a drop in blood pressure, due to the heart's attempt to compensate for lack of blood supply to the brain. *Id.* Symptoms can include lightheadedness, dizziness, syncope, and severe fatigue. *Id.* at 11, 92. He was somewhat vague, however, in explaining whether POTS is a condition distinct from orthostatic intolerance, or merely a *kind* of orthostatic intolerance. *Id.* at 93.

Dr. Shoenfeld asserted that POTS is a progressive, slowly-developing condition. Tr. at 95; *see also* K. Ozawa, et al., *Suspected Adverse Effects After Human Papillomavirus Vaccination: a Temporal Relationship Between Vaccine Administration and the Appearance of Symptoms in Japan*, 40 Drug Saf. 1219, 1-11 (https://doi.org/10.1007/s40264-017-0574-6) (2017), filed as Ex. 91 (ECF No. 89-1) ("Ozawa"). He also proposed that it is autoimmune in nature. In so testifying, Dr. Shoenfeld explained that autoimmune diseases generally manifest as a result of both genetic and environmental factors, and typically occur in young women. Tr. at 14-15. An autoimmune disease or disorder is in essence an instance in which an individual's immune system reacts hyperactively, attacking self along with foreign infectious agents. *Id.* at 15-16. With respect to POTS specifically, Dr. Shoenfeld relied on the presence of certain autoantibodies in patients diagnosed with POTS as evidence of its autoimmune nature. *Id.* at 23. He also offered some literature that he said established this – in particular, a Mayo Clinic article prepared by eminent members of Mayo's Autonomic Disorders Center. *Id.;* M. Thieben, et al., *Postural Orthostatic Tachycardia Syndrome: the Mayo Clinic Experience*, 82 Mayo Clin. Proc. 308, 308-13 (2007), filed as Ex. 20 (ECF No. 54-1) ("Thieben") (finding approximately 14 percent of tested POTS

patients had low positive values for ganglionic[12] AChR antibody[13]). And he noted as well other research involving lupus (known to be an autoimmune condition) that had observed that a large percentage of lupus patients also experienced orthostatism, thereby allowing the inference that orthostatic disorders could themselves also be autoimmune in nature. Tr. at 24.

To connect the HPV vaccine specifically to POTS, Dr. Shoenfeld cited several items of literature discussing case reports that he maintained support such a link. Tr. at 25. For example, a Japanese study recorded four instances of POTS in a group of 40 teenage girls who had recently received the HPV vaccine, plus eight more who displayed signs of orthostatic hypotension. T. Kinoshita, et al., *Peripheral Sympathetic Nerve Dysfunction in Adolescent Japanese Girls Following Immunization with the Human Papillomavirus Vaccine,* 53 Intern. Med. 2185, 2185-2200 (2014), filed as Ex. 89 (ECF No. 85-24) ("Kinoshita"). Kinoshita, however (as later pointed out by Respondent's expert), was somewhat marred by self-selection,[14] since the studied individuals all voluntarily reported to a Japanese syncope clinic (and therefore the study lacked any control group), and it did not involve any specific investigation into the actual causal role of the vaccine. A similarly-structured study in Denmark (focusing on young women who had recently received the HPV vaccine and were then referred to a syncope treatment unit due to reported orthostatic intolerance symptoms) observed 21 cases of POTS out of 35 studied individuals. L. Brinth, et al., *Orthostatic Intolerance and Postural Tachycardia Syndrome as Suspected Adverse Effects of Vaccination Against Human Papillomavirus,* 33 Vaccine 2602, 2602-05 (2015), filed as Ex. 24 (ECF No.54-4) ("Brinth"). He also attempted to relate POTS to the HPV vaccine by noting that POTS patients frequently experience small fiber neuropathy – a condition that has been vaccine-associated (although not connected to the HPV vaccine specifically). Tr. at 29-30.[15]

[12] Ganglionic is defined as "pertaining to a ganglion." *Dorland's* at 760. A ganglion is an anatomical term for a "group of nerve cell bodies located outside the central nervous system." *Id.* at 757. The term can also be applied to a group of nuclear cell groups within the brain. *Id.*

[13] A ganglionic AchR antibody is the most commonly detected marker for autoimmune dysautonomia. *See Testing for Autoimmune Disorders*, Mayo Clinic, https://www mayomedicallaboratories.com/articles/features/autoimue/index. html (last accessed on Mar. 6, 2018).

[14] Self-selection or self-reporting can be a form of selection bias. Selection bias is defined as "systematic error due to [a] nonrandom selection of subjects for study." *Reference Manual on Scientific Evidence* 296 (3rd ed. 2011).

[15] Petitioner also offered an article written by the primary treater who diagnosed her POTS, Dr. Blitshteyn. *See* S. Blitshteyn, *Postural Tachycardia Syndrome Following Human Papillomavirus Vaccination,* 21 Eur. J. Neurol. 134-

Based on such literature and studies, Dr. Shoenfeld maintained that there was a plausible biologic mechanism by which the HPV vaccine could cause POTS: molecular mimicry. Shoenfeld First Rep. at 19-20. Dr. Shoenfeld described molecular mimicry as occurring when the body is exposed to an environmental factor (such as a vaccine or infection), which results in a cross-reaction between autoantibodies (produced by the body) and a self structure that the foreign antigen has mimicked. *See* N. Agmon-Levin, et al., *Vaccines and Autoimmunity*, 5 Nat. Rev. Rheumatol. 648, 650 (2009), filed as Ex. 81 (ECF No. 85-16) ("Agmon-Levin"); Tr. at 38; Shoenfeld First Rep. at 18-20. In so proposing, Dr. Shoenfeld relied almost exclusively on a single scientific article to establish homology between protein components of the HPV vaccine and human protein structures. Tr. at 22; D. Kanduc, et al., *Quantifying the Possible Cross-Reactivity Risk of an HPV16 Vaccine*, 8 J. Experimental Therapeutics & Oncology 65, 65-76 (2009), filed as Ex. 84 (ECF No. 85-19) ("Kanduc"); Shoenfeld First Rep. at 20. Kanduc examined the HPV16 polyprotein and recorded amino acid sequence similarities to the human proteome at the heptamer level, concluding that the proteome contains eighty-two heptapeptides and two octapeptides also found in the HPV16 vaccine. Kanduc at 65. There was thus, in Dr. Shoenfeld's view, sufficient identity between a vaccine component and "our body constituents" for a cross-reaction to theoretically occur. Tr. at 22. He admitted that most homology between a foreign antigen and self protein structure is not meaningful in a pathogenic sense, but nevertheless maintained that "it's [a] completely different story" when vaccine is involved, given a vaccine's capacity to stimulate the immune system (due largely to the adjuvants contained therein). *Id.* at 100-02.

Dr. Shoenfeld was somewhat less certain as to *where* in the body this cross-reaction was purportedly occurring. At best, he proposed that the target antigen for the reaction involved in his theory is the channel receptor (potassium or calcium). Tr. at 136. More specifically, he categorized the location as a nerve ending receptor, "maybe in the heart, or where the autonomic nervous system resides." *Id.* at 137. Dr. Shoenfeld did not submit literature to support his target antigen opinion, however, but relied on literature supporting a broad application of his theory, suggesting

39 (2014), filed as Ex. 21 (ECF No. 54-2) ("Blitshteyn"). In it, Dr. Blitshteyn reviews six case studies of post-HPVvaccine POTS, three of whom had also been diagnosed with small fiber neuropathy. Blitshteyn at 136,Table 1. Although the article does favor classification of POTS as autoimmune, it does not state that small fiber neuropathy is linked to POTS. Blitshteyn at 138. In addition, Blitshteyn's case studies all involved symptoms onset occurring no later than two months post-vaccination (*see* Table 1), and Dr. Blitshteyn hedged in suggesting the reliability of the conclusion that the HPV vaccine was causal. *Id.* (temporal association between HPV vaccine and POTS "deserves further investigation for assessment of a *possible* causal relationship" (emphasis added)).

that the cross-reaction occurs between the vaccine component and self antigens generally or host tissue expressing antigens. *See* Agmon-Levin at 3; Kanduc at 1. Even so, this aspect of his theory otherwise reflected a topic outside of his immediate research expertise or practical experience, and he cited no literature directly addressing the autoimmune nature of POTS. Indeed – he largely admitted that, other than evidence of homology between the HPV vaccine and certain self proteins, and some speculation as to the target for the autoimmune attack, he could offer little in the way of evidence suggesting that the HPV vaccine had ever been shown from a reliable experiment or study to be pathogenic in the way argued herein. *Id.* at 138.

Dr. Shoenfeld also proposed a possible inciting factor in the theorized autoimmune cross-reaction: alum, an adjuvant included in the HPV vaccine due to its ability to elicit a more vigorous immune response. Tr. at 16, 28, 38; Shoenfeld First Rep. at 18. In support, he referenced several pieces of literature exploring the precise means by which alum accomplishes its immune system-stimulating function, resulting in an increase in autoimmune manifestations in humans. *See*, *e.g.*, Agmon-Levin; N. Agmon-Levin, et al., *Chronic Fatigue Syndrome with Autoantibodies – The Result of an Augmented Adjuvant Effect of Hepatitis-B Vaccine and Silicone Implant*, 8 Autoimmun. Rev. 52, 52-55 (2008), filed as Ex. 63 (ECF No. 84-30). Dr. Shoenfeld opined that if the HPV vaccine had not contained the alum adjuvant, Ms. Johnson would not have experienced any autoimmune reaction resulting in POTS. Tr. at 38.[16]

After outlining his theory, Dr. Shoenfeld attempted to apply it to Ms. Johnson's medical history. First, he maintained that Ms. Johnson's medical record established the accuracy of her POTS diagnosis. He documented POTS symptoms that he maintained the medical record established: lightheadedness, dizziness, syncope, palpitations, exacerbation by exercise, weakness, dyspnea, shortness of breath, cold extremities, visual disturbances, nausea, and trouble sleeping. Tr. at 11, 30-31. He also noted that she had a somewhat low white blood cell count, which can evidence a lack of blood supply to the periphery. *Id.* at 12. Dr. Shoenfeld acknowledged, however, that Ms. Johnson had displayed a low white blood cell count *prior* to vaccination. *Id.* at 47-48.

[16] In making this argument, Dr. Shoenfeld was careful to add that he was *not* invoking ASIA theory (*see*, *e.g.*, Tr. at 57-58) – although such protestations were undermined by the very fact that he could not help but stress the role of the vaccine's adjuvant in causing the alleged autoimmune reaction, even if he did not refer to this with the ASIA acronym.

Additional evidence of the autoimmune character of Petitioner's POTS was the fact that Ms. Johnson tested positive for a high (or, more accurately, a "weak elevated") antinuclear antibody ("ANA") level during a visit to a rheumatologist in October 2013. Tr. at 12-13, 45, 133. Dr. Shoenfeld stressed that even a slightly positive ANA could support the existence of an autoimmune disease. *Id.* at 41. He later, however, acknowledged that ANAs are not associated directly with POTS, and that positive ANA levels were otherwise not primary evidence of the existence of an autoimmune disease.[17] *Id.* at 46. He also stressed the importance of family history suggesting a common susceptibility to autoimmune diseases, noting that Petitioner's family had reported several autoimmune conditions. *Id.* at 17-19, 178-79 (Mrs. Johnson testifying about family disease history such as hypothyroidism).[18] Dr. Shoenfeld noted that there are genetic markers correlated with a tendency to develop autoimmune diseases, although he acknowledged that he was not aware of one specifically associated with POTS. *Id.* at 135.

However, Dr. Shoenfeld admitted that even circumstantial proof corroborating the autoimmune character of Ms. Johnson's symptoms was limited. For example, treaters never tested Ms. Johnson for any of the autoantibodies that arguably might be related to POTS or other dysautonomic disorders or diseases. Tr. at 24. But he opined generally that autoimmune diseases generate "plenty" of autoantibodies, and the lack of specific evidence that an individual possesses a particular one does not diminish the conclusion herein that Ms. Johnson experienced autoimmune POTS due to the third dose of the HPV vaccine. *Id.* Overall, Dr. Shoenfeld opined that the main factors evidencing an immune reaction in the Petitioner included her course of symptoms, the presence of the elevated ANA levels, and the fact of the POTS diagnosis itself (which he insisted is known to be an autoimmune condition). *Id.* at 134 ("we don't need more than the disease is of an autoimmune nature"). *Id.*

As to onset, Dr. Shoenfeld opined that Ms. Johnson initially developed POTS symptoms

[17] In his expert report, Dr. Shoenfeld also stated that Ms. Johnson's test results indicated the presence of antiphospholipid antibodies and lupus anticoagulant, which he relied upon in opining as to the underlying autoimmune nature of Ms. Johnson's condition. Tr. at 48. However, he later corrected that statement, confirming that her results did *not* indicate the presence of either. *Id.; see also Id.* at 49-50. In so doing, he admitted that part of his original report had been mistakenly copied from a report submitted on behalf of a *different* Vaccine Program petitioner. *Id.* at 53-55.

[18] Respondent's expert, Dr. Kenneth Mack, agreed that individuals genetically predisposed to autoimmunity would more likely have an abnormal response to vaccination (although, as discussed below, he largely disputed the contention that POTS is broadly an autoimmune condition. Tr. at 274.

five weeks post-vaccination, or by March 29, 2011, becoming progressively worse over the next year or more. Tr. at 32-33, 61, 65, 70. In so arguing, Dr. Shoenfeld forcefully maintained that even though the records from the March 29th visit do *not* mention symptoms that could be deemed evidence of POTS, such as shortness of breath, they were incorrect, reflecting a misdiagnosis or a treater's view that her shortness of breath was not severe enough to constitute "true" dyspnea. *Id.* at 69, 102, 104.[19] Thus, Dr. Shoenfeld proposed that where a record stated that treaters observed a cough, or that Petitioner had informed them she was coughing, the record was in error. *Id.* at 32, 64. He relied in part on Mrs. Johnson's testimony for this interpretation of the record, suggesting that she more reliably recalled her daughter's symptoms than contemporaneous treaters. *Id.* at 71.[20] He also proposed that, because Petitioner was an early adolescent, she had likely confused her own shortness of breath for a cough, and thus misinformed her treaters. *Id.* at 65, 103. And the fact that Petitioner did not report in March 2011 other POTS symptoms, such as fatigue, was dismissed by Dr. Shoenfeld as irrelevant, given his view that POTS would invariably progress over time. *Id.* at 64, 65, 94-95.

Dr. Shoenfeld similarly attempted to rebut other contemporaneous medical records that were inconsistent with his theory. When asked about Petitioner's May 2011 records (when she was diagnosed with bronchitis, and an x-ray revealed lung congestion suggestive of pneumonia), Dr. Shoenfeld maintained that the fact that she did not report a fever at the time was "unusual," since he would associate any such inflammatory condition with fever – and therefore her treaters again likely misdiagnosed her. Tr. at 68-69. He also pointed to the absence of complaints of dyspnea at this time (a significant clinical factor, under his theory, evidencing POTS) as *undermining* the suggestion she had pneumonia, since in his view "there is no pneumonia . . . without shortness of

[19] Dr. Shoenfeld went quite far in his attempt to dispute the accuracy of Ms. Johnson's diagnosis at this time (and in doing so made some assertions that were highly unpersuasive, if not confusing). For example, he challenged the accuracy of the URI diagnosis by arguing that her treaters never identified the exact viral infection at issue via testing, and therefore their diagnosis lacked foundation. Tr. at 65-66. He also seemed to suggest that whether Ms. Johnson's infection was bacterial or viral was significant to her diagnosis, although he did not articulate in a clear fashion why this was so. *Id.* at 67-68.

[20] Dr. Shoenfeld's trust in the accuracy of Mrs. Johnson's testimony and recollection about the nature of Petitioner's symptoms, in contrast to what the record sets forth, was inconsistent. Thus, although the May 2011 records seem to indicate that Petitioner was diagnosed with pneumonia and/or bronchitis – something Mrs. Johnson's witness statement admits (Tr. at 154) – Dr. Shoenfeld maintained that this diagnosis was also incorrect, and that all Mrs. Johnson was doing was repeating what she was told. Tr. at 73-75.

breath." *Id.* at 70. By June 2011, when Petitioner did report shortness of breath but her treaters characterized that as reflecting her recovery from bronchitis, Dr. Shoenfeld proposed instead (along with his consistent contention that these treaters erred) that Petitioner's 2015 diagnosis of POTS revealed, in hindsight, the error of this interpretation of her symptoms. *Id.* at 87. Dr. Shoenfeld offered comparable critiques of Ms. Johnson's September 2011 doctor's visit, when she was diagnosed with strep throat. *Id.* at 88-90.

By contrast, Dr. Shoenfeld asserted that the records of Ms. Johnson's 2012 hospitalization, and suspicion that she was suffering from myasthenia gravis, were wholly consistent with his theory. Myasthenia gravis is considered an autoimmune disease, with autoantibodies similar to those thought related to POTS. Tr. at 97-98. Dr. Shoenfeld was, however, compelled to admit that Petitioner had *not* tested positive for such autoantibodies. *Id.* at 98-99.

While diminishing the accuracy of early treater views, Dr. Shoenfeld placed great weight on Dr. Blitshteyn's POTS diagnosis, coupled with the 2016 tilt table test, despite the fact that both were obtained more than five years after Petitioner's HPV vaccination. Tr. at 59, 94-94, 135. In his view, the delayed diagnosis was somewhat consistent with the condition itself, stating that "you cannot actually see the orthostatism" early in POTS, both due to its progressive nature as well as the fact that individuals suffering from it will take steps to avoid symptoms (for example, by not standing abruptly). *Id.* at 97, 123-24. Dr. Shoenfeld argued, however, that Ms. Johnson likely would have been diagnosed with POTS as early as 2012 had she been properly tested. *Id.* at 116.

As far as the appropriateness of the timing of Ms. Johnson's alleged onset, Dr. Shoenfeld proposed that five weeks was adequate. Indeed – he allowed that an onset of up to seven months, if not several years, could be medically appropriate, depending on the type of autoantibodies induced by the vaccine. Tr. at 131-32. For support, Dr. Shoenfeld referenced Ozawa, which found that the average appearance of symptoms following HPV vaccine was 360 days from vaccination. *Id.* at 87; Ozawa at 9. Ozawa itself, however, notes that the average time for onset observed was "very long in comparison with the adverse effects of conventional vaccinations," attributing this in part to the fact that "it is rather difficult to determine the exact time of onset" – not to mention the study's other acknowledged limitations (lack of control group, self-selection of studied subjects, etc.). Ozawa at 9. Dr. Shoenfeld for his part was dismissive of placing *any* time limit on

what would be reasonable for onset of a vaccine-induced injury, arguing that (based on his expertise in studying autoimmune illnesses) a post-vaccination onset of several weeks was no more reliable or appropriate than several months. Tr. at 33.

As an overall matter, Dr. Shoenfeld acknowledged that his opinion was based to a large extent on the discrepancy between Ms. Johnson's pre-vaccination health record (which revealed no documented medical problems prior to vaccination) and her subsequent problems, as well as the fact that her many treaters (before Dr. Blitshteyn) were unable to identify an explanation for her condition more persuasive than the POTS diagnosis. Tr. at 12, 27.

B. *Dr. Kenneth Mack*

Dr. Mack served as Respondent's expert, filing two reports in the case and testifying at trial. *See* Report, dated December 7, 2015, filed as Ex. A (ECF No. 39-1) ("First Mack Rep."); Report, dated February 10, 2017, filed as Ex. C (ECF No. 59-1) ("Second Mack Rep."); Tr. at 202-336.[21]

As his CV indicates, Dr. Mack is the chair of child and adolescent neurology at the Mayo Clinic in Rochester, Minnesota. CV, filed as Ex. P (ECF No. 94-1) at 2 ("Mack CV"); Tr. at 203. Dr. Mack received his undergraduate degree, medical degree, and PhD from the University of Illinois. Mack CV at 2; Tr. at 204-06. Following medical school, he completed residencies in both pediatrics and neurology, and a fellowship in child neurology at Washington University. Mack CV at 1. Currently, he is board certified in neurology with special qualifications in child neurology. Mack CV at 3. At hearing, Dr. Mack testified that 90 percent of his time is devoted to seeing patients – mostly children – and his specialty is headaches and associated symptoms, such as dizziness. Tr. at 206. His opinion in this case was based solely on his own expertise and review of the Petitioner's medical records. *Id.* at 248-49.

Dr. Mack is admittedly not an expert on autonomic issues or POTS, although he does see hundreds of patients a year who suffer from it or some other form of orthostatic intolerance. Tr. at

[21] Respondent also filed (on August 18, 2017) a one-page clarification of Dr. Mack's second report, in order to correct a statement therein. His second report had said that he agreed Ms. Johnson had POTS – but he meant to say only that she had "symptoms of" POTS, without accepting Dr. Blitshteyn's diagnosis. Ex. N, filed as ECF No. 79-2.

206. He also has published a few articles on POTS. *Id.* at 207. In particular, Dr. Mack co-authored with some of his Mayo Clinic colleagues a review article on the existing scientific and medical thinking about POTS, and also more recently co-authored an article specifically exploring whether there is a reasonable scientific association between the HPV vaccine and POTS. J. Johnson, et al., *Postural Orthostatic Tachycardia Syndrome: A Clinical Review,* 42 Ped. Neurol. 77, 77-85 (2010), filed as Ex. A, Tab. 7 (ECF No. 46-2) ("Johnson"); B. Butts, et al., *Human Papillomavirus Vaccine and Postural Orthostatic Tachycardia Syndrome: A Review of Current Literature,* 20 J. Child Neurol. 10:1-10 (2017), filed as Ex. O (ECF No. 79-3) ("Butts").[22] Dr. Mack's writing on these topics renders him (in his view) "one of the more knowledgeable people in the United States" on the condition. Tr. at 247. Dr. Mack does not, however, have specific training in immunology. *Id.* at 249.

Dr. Mack began with a discussion of POTS. He deemed it a type of orthostatic intolerance, characterized by dizziness and lightheadedness upon standing, but which can be alleviated by "recumbency" (sitting or lying down). Tr. at 210-12. It is a common in adolescence, although it can vary in how it presents and its overall symptoms. *Id.* at 210. Dr. Mack did not deem it a progressive condition, noting that some individuals may experience POTS symptoms in a transient manner, while others will display consistent symptoms over a long period of time, without ever experiencing an increase in severity. *Id.* at 335-36. The etiology of POTS is uncertain, although Dr. Mack did allow that it can develop secondarily to a chronic illness, as a result of "deconditioning" - where an individual has greatly limited her physical activity, resulting in a weakening of blood vessels and a corresponding inability to respond to orthostatic changes. *Id.* at 214, 217-18.

Dr. Mack agreed with Dr. Shoenfeld that it is not easy to diagnose POTS, although he did

[22] Dr. Mack admitted under cross-examination that at the time Butts was written, he was consulting with the Government with respect to Vaccine Program matters, and was also aware that he could be asked to testify on the issues relating to POTS discussed in Johnson (although he denied that the paper was prepared for that purpose). Tr. at 267-68. Problems can arise when any expert offers his own literature to support an opinion – especially if that literature has been prepared with some eye toward its use in litigation. However, I do not find in this case that Dr. Mack's authorship of this article raises a tenable credibility problem impacting the weight to be afforded his testimony – especially given his demonstrated expertise with POTS from a clinical perspective. If it did, then I would also have to consider not only the fact that Dr. Shoenfeld references (by my count) 20 articles he co-authored as supporting his opinion, but also that he has (in certain cases in which he offered expert opinions) referenced literature *directly addressing* the relevant petitioner. *See, e.g., L.A.M. v. Sec'y of Health & Human Servs.*, No. 11-852V, 2017 WL 527576 (Fed. Cl. Spec. Mstr. Jan. 31, 2017).

propose that the criteria for formal diagnosis in adolescents and children are fairly fixed. Tr. at 264. In particular, he maintained that a POTS diagnosis would need to be supported by a properly-conducted tilt table test, demonstrating a heart rate increase of 40 beats per minute ("bpm") for adolescents and children – more than the 30 bpm necessary to diagnose POTS in an adult. *Id.* at 211, 293-94, 306, 325-26; *see also* Butts at 8 (citations omitted). Dr. Mack rejected the concept that shortness of breath is associated with POTS, although he distinguished it from exercise intolerance and post-exercise windedness. Tr. at 255-56. Chronic fatigue, on the other hand, can be a presenting symptom, and individuals diagnosed with chronic fatigue syndrome frequently have POTS as well. *Id.* at 261; Johnson at 78. Weight loss often precedes POTS, but POTS does not lead to it. *Id.* at 261-62.

Given the nature of Dr. Shoenfeld's causation theory, Dr. Mack was asked many questions about his views regarding the purported autoimmune nature of POTS. He acknowledged that vaccines have been associated with autoimmune diseases, and admitted as well that a particular ganglionic antibody was at one time considered to have a potential association with certain instances of POTS (although not *all* occurrences of POTS could be deemed autoimmune). Tr. at 214-15, 273-74; Johnson at 81; Thieben at 308 ("[o]ur findings suggest . . . a substantial percentage of [POTS] cases may be autoimmune"), 311 (6 of 42 tested subjects, or 14.3 percent, were positive for the ganglionic antibody).[23] However, he stressed as well that subsequent research and study had not corroborated a causal relationship with this autoantibody and POTS in any reliable sense. Tr. at 292. He also emphasized that Petitioner had not been shown to possess this particular autoantibody. *Id.* at 298. Dr. Mack otherwise rejected Dr. Shoenfeld's argument that Ms. Johnson's positive ANA was evidence of the autoimmune etiology of her POTS, noting that a significant number of individuals without an autoimmune illness test positive for heightened ANA titers.[24] *Id.* at 215, 252-53. Because there was no other record evidence suggesting that Ms. Johnson had ever experienced any symptoms that might reflect an ongoing autoimmune process, "I struggle to see

[23] Dr. Mack also pointed out that Thieben used the term "neuropathic" to describe the kind of cases in which POTS could be autoimmune (Thieben at 308), but he did not deem that to be coterminous with autoimmunity. Tr. at 291.

[24] Dr. Mack made a point of stressing that elevated ANA titers actually raise rheumatologic concerns, since they are principally associated with known autoimmune rheumatologic diseases like lupus. Tr. at 254. But in Ms. Johnson's case, testing evidenced in the medical record (such as C3 or C4 complement levels) never corroborated the presence of any such diseases, nor did they reveal the presence of ongoing inflammation. *Id.* at 253.

an autoimmune condition here." *Id.* at 279, 333-34.[25]

Dr. Mack directly contested the concept that the HPV vaccine could cause POTS, frequently referencing studies and literature referenced in Butts (which specifically endeavored to evaluate the current literature suggesting such a link). *See generally* Tr. at 236-41 ("there is no high-quality evidence to show [a] causal relationship"). Butts included evaluation of numerous items of literature offered in this case by Petitioner, such as Kinoshita and Brinth. Butts at 3-4 (Tables I and II). Butts ultimately concluded, after consideration of each type of scientific evidence examining the alleged relationship between the HPV vaccine and POTS, that causality could not be determined even on the basis of the extensive amount of literature examined. *Id.* at 7-8.

Dr. Mack also pointed out that a number of large-scale cohort epidemiologic studies had not confirmed any relationship between the vaccine and autoimmune diseases, as well as conditions involving orthostatic intolerance, such as syncope. *Id.* at 216-17. In support, Respondent filed a particular article involving such a large-scale study that often is raised in cases involving the HPV vaccine, C. Chao, et al., *Surveillance of Autoimmune Conditions Following Routine Use of Quadrivalent Human Papillomavirus Vaccine*, 271 J. Intern. Med. 193, 193-203 (2012), filed as Ex. A, Tab 4 (ECF No. 45-4) ("Chao"). Chao (funded but not authored by Gardasil's manufacturer, Merck & Co.) was a peer-reviewed observational study analyzing a database comprised of the medical histories of approximately 189,000 women (members of two of Kaiser Permanente's managed care health organizations in the State of California) to determine whether the studied population had developed a variety of autoimmune conditions after receiving the Gardasil vaccine. Chao at 194. The researchers compared the results of the studied vaccinated population with unvaccinated, similarly-situated individuals also enrolled with Kaiser Permanente in Southern California, in order to compare incidence ratios for the identified autoimmune conditions. *Id.* at 194-95. Chao did not observe an increased risk of developing autoimmune

[25] Dr. Mack also commented on other aspects of Petitioner's theory attempting to associate POTS with other conditions known (or speculated) to be autoimmune. For example, he acknowledged that individuals with small fiber neuropathy (which is thought to be autoimmune) might also display some autonomic dysfunction, but disagreed that the conditions are coterminous or closely linked. Tr. at 297-98, 303. And he allowed that, as reflected in Ozawa, the Japanese Health Ministry had at one point proposed an association between the HPV vaccine and chronic regional pain syndrome ("CRPS") - but denied that this association had been reliably demonstrated, disputed that CRPS was associated with POTS, and also questioned if CRPS could be deemed autoimmune in character. *Id.* at 305-06.

conditions following receipt of the Gardasil vaccine (although Chao did not specifically look for POTS). Tr. at 238, 281; Chao at 197.[26] Other large epidemiologic studies produced similar outcomes, thereby casting doubt on an association between the HPV vaccine and POTS or some comparable form of orthostatic intolerance. Tr. at 270-71, 282, 286-88.[27] To the extent scientific or medical articles observed any correlation, they were merely recording a temporal association attributable simply to the fact that teenage women (the group most likely to experience POTS) were the primary group receiving the vaccine in the first place. *Id.* at 277 ("most people who would develop POTS are at the age where they have been recently exposed to the HPV vaccine").

Turning to Petitioner's medical records, Dr. Mack opined that he saw no evidence of any POTS-associated symptoms any time before her doctor's visit with Dr. Burris in February 2013. Tr. at 209, 213. Nothing in Ms. Johnson's presentation from her March 2011 doctor's visit was suggestive of POTS, such as fatigue or dizziness upon standing. *Id.* at 219-20. Her symptoms reported in May 2011, such as a productive cough, were (as the contemporaneous treaters proposed) consistent with pneumonia or bronchitis, but not POTS. *Id.* at 221, 258. And the shortness of breath reported after exercise, as reflected in Ms. Johnson's June 2011 records, was not significant diagnostically without complaints of light-headedness, which she denied. *Id.* at 222.

Dr. Mack also commented on aspects of the record discussing instances in which Petitioner complained of headache – more often in her records beginning in 2012, around the time myasthenia gravis was suspected. He allowed that headache is a comorbid condition with POTS, but explained that in his experience, the *kind* of headache would be different from what Petitioner reported. Tr. at 226-27, 259. POTS patients most frequently report what Dr. Mack called a "coat hanger" headache, emanating bilaterally from the neck and shoulders. *Id.* at 226. The medical record for

[26] When cross examined, Dr. Mack admitted that Chao did seem to find an association with Hashimoto's disease, which is known to be autoimmune. Tr. at 277-78. However, Dr. Mack noted that Chao stated that "further investigation of the temporal relationship and biological plausibility revealed no consistent evidence for a safety signal for autoimmune thyroid conditions." *Id.* at 278, *quoting* Chao at 193.

[27] One study referenced by Dr. Mack involved the review of over 600,000 instances of HPV vaccinations given to females between the ages of nine and twenty-six over a three-year period, and found no statistically-significant increased risk for a number of adverse events, including syncope. J. Gee, et al., *Monitoring the Safety of Quadrivalent Human Papillomavirus Vaccine: Findings from the Vaccine Safety Datalink*, 29 Vaccine 8279, 8279-94 (2011) ("Gee"). Petitioner attempted to point out language in Gee suggesting its authors' acknowledgment that it was not *sufficiently* powered to detect "rare" occurrences. Tr. at 286. In response, Dr. Mack proposed the view that POTS was not particularly rare. *Id.*

Ms. Johnson from this time, however, suggested a unilateral headache involving her right eye, and Dr. Mack could not on the basis of the records available conclude that the headaches she was experiencing were evidence of POTS. *Id.* at 227-28, 259-60. He also noted that Petitioner's ptosis was not a symptom clinically associated with POTS. *Id.* at 229.

By the time of Petitioner's February 2013 visit with Dr. Burris, however, Dr. Mack allowed that Petitioner was unquestionably experiencing symptoms that made a POTS diagnosis more credible (even though he did not accept that diagnosis ultimately in this case). Tr. at 229, 249-50, 296. In particular, the record revealed evidence of weakness, recent rapid weight loss, and (most notably) dizziness when standing up – a strongly-associated presenting symptom of POTS. *Id.* at 230-33. Because this record noted that Ms. Johnson had been experiencing this set of symptoms for about three months (Ex. 4 at 70), it was reasonable to conclude their onset had manifested in November 2012. *Id.* at 330-31. He affirmatively stated that had he been presented by such a fact pattern at this time, he would have then ordered a tilt table test to obtain the data needed for a formal POTS diagnosis. *Id.* at 335.

With respect to onset, Dr. Mack acknowledged that POTS (if autoimmune in character) could develop after some kind of trigger within "days to weeks," although he disputed the possibility of it developing several months later – let alone almost two years. Tr. at 242, 250. In his own experience with known autoimmune neurologic illnesses (citing Sydenham's chorea[28] in particular), Dr. Mack had never observed an autoimmune pathologic process take more than six months to occur, and he deemed that timeframe an "outer limit." *Id.* at 250-51. He did not accept the reliability of certain literature cited by Petitioner in support for a longer onset, such as Ozawa, noting that the case report nature of the study, coupled with the fact that its subjects were self-selected, greatly diminished its trustworthiness as persuasive scientific evidence – not to mention the fact that he simply deemed a lengthy onset timeframe to be inherently unreliable. *Id.* at 318 ("something that had happened [a year] ago does not have a bearing on your current symptoms"), 322-24.

[28] Sydenham's chorea is an acute neurological disorder usually occurring in children between the ages of five and fifteen. *Dorland's* at 354. It is closely linked with rheumatic fever. *Id.* Symptoms can include involuntary movements that gradually become more severe (hindering gait, arm movements, and speech). *Id.* Symptoms can be localized, affecting only a small portion of the body, or may take the form of muscular rigidity (paralytic chorea). *Id.*

Dr. Mack was asked on cross examination questions about some of the literature Petitioner cited in support of her contention that the HPV vaccine is associated with POTS (much of which he was already familiar with due to his co-authorship of Butts). *See, e.g.*, Tr. at 319-20. As a general matter, Dr. Mack expressed the view that Petitioner's literature consistently relied on passive surveillance reporting or case studies which lacked controls, and therefore merely reported a correlation that was more likely attributable to the overlap between the age group of POTS patients and the age of HPV vaccine recipients. *Id.* at 276, 308. He deemed case reports inherently less trustworthy than cohort studies, which attempt to compare only like individuals and employ proper scientific methodologies. *Id.* at 309-10. As a result, he greatly discounted the value of literature like Kinoshita or Brinth, both of which involved self-selection by the studied subjects (since only those who chose to seek treatment for syncope were included as subjects) and otherwise lacked the scientific reliability of large-scale cohort study. *Id.* at 307, 314, 316.

Dr. Mack ultimately did not accept the POTS diagnosis made by Dr. Blitshteyn, noting that no other treaters in Ms. Johnson's medical history supported it. Tr. at 236, 247-48. He also disputed the accuracy of the 2016 tilt table test, maintaining that medication the Petitioner was taking at the time might have skewed the results, and also questioning whether the test in fact was conducted appropriately or measured the 40 bpm increase necessary to make the diagnosis for an adolescent. *Id.* at 233-36, 262, 327, 329. At best, he allowed for the fact that Petitioner had some symptoms that could be deemed associated with POTS. *Id.* at 244. He also acknowledged that the complexity of her overall presentation made an overarching diagnosis difficult. *Id.* at 213, 244.

IV. Procedural History

As stated above, this case was initiated in March 2014. After nearly a year of medical records gathering and filing, Respondent filed her Rule 4(c) Report in March 2015 (ECF No. 23), recommending against an entitlement award.

In September 2015 (after three requests for an extension), Ms. Johnson filed Dr. Shoenfeld's first expert report and numerous items of medical literature in support. In response, Dr. Mack's expert report was filed by Respondent in December of that same year. Petitioner responded by filing two additional expert reports from Dr. Shoenfeld, one in March 2016 (ECF No. 84-11), and a second in August 2017 (ECF No. 84-1). Petitioner submitted one supplemental

report from Dr. Mack in February 2017 (ECF No. 59-1).

After the filing of expert reports, a hearing was set in this matter for October 12, 2017 (ECF No. 69). The hearing went forward as scheduled, and the parties did not request the opportunity to file post-hearing briefs. The matter is ripe for adjudication.

V. Applicable Legal Standards

A. *Petitioner's Overall Burden in Vaccine Program Cases*

To receive compensation in the Vaccine Program, a petitioner must prove either: (1) that he suffered a "Table Injury" – *i.e.*, an injury falling within the Vaccine Injury Table – corresponding to one of the vaccinations in question within a statutorily prescribed period of time or, in the alternative, (2) that his illnesses were actually caused by a vaccine (a "Non-Table Injury"). *See* Sections 13(a)(1)(A), 11(c)(1), and 14(a), as amended by 42 C.F.R. § 100.3; § 11(c)(1)(C)(ii)(I); *see also Moberly v. Sec'y of Health & Human Servs.*, 592 F.3d 1315, 1321 (Fed. Cir. 2010); *Capizzano v. Sec'y of Health & Human Servs.*, 440 F.3d 1317, 1320 (Fed. Cir. 2006).[29] In this case, Petitioner does not assert a Table claim.

For both Table and Non-Table claims, Vaccine Program petitioners bear a "preponderance of the evidence" burden of proof. Section 13(1)(a). That is, a petitioner must offer evidence that leads the "trier of fact to believe that the existence of a fact is more probable than its nonexistence before [he] may find in favor of the party who has the burden to persuade the judge of the fact's existence." *Moberly*, 592 F.3d at 1322 n.2; *see also Snowbank Enter. v. United States*, 6 Cl. Ct. 476, 486 (1984) (mere conjecture or speculation is insufficient under a preponderance standard). Proof of medical certainty is not required. *Bunting v. Sec'y of Health & Human Servs.*, 931 F.2d 867, 873 (Fed. Cir. 1991). In particular, a petitioner must demonstrate that the vaccine was "not only [the] but-for cause of the injury but also a substantial factor in bringing about the injury." *Moberly*, 592 F.3d at 1321 (quoting *Shyface v. Sec'y of Health & Human Servs.*, 165 F.3d 1344, 1352-53 (Fed. Cir. 1999)); *Pafford v. Sec'y of Health & Human Servs*., 451 F.3d 1352, 1355 (Fed.

[29] Decisions of special masters (some of which I reference in this ruling) constitute persuasive but not binding authority. *Hanlon v. Sec'y of Health & Human Servs.*, 40 Fed. Cl. 625, 630 (1998). By contrast, Federal Circuit rulings concerning legal issues are binding on special masters. *Guillory v. Sec'y of Health & Human Servs.*, 59 Fed. Cl. 121, 124 (2003), *aff'd* 104 F. App'x 712 (Fed. Cir. 2004); *see also Spooner v. Sec'y of Health & Human Servs.*, No. 13-159V, 2014 WL 504728, at *7 n.12 (Fed. Cl. Spec. Mstr. Jan. 16, 2014).

Cir. 2006). A petitioner may not receive a Vaccine Program award based solely on his assertions; rather, the petition must be supported by either medical records or by the opinion of a competent physician. Section 13(a)(1).

In attempting to establish entitlement to a Vaccine Program award of compensation for a Non-Table claim, a petitioner must satisfy all three of the elements established by the Federal Circuit in *Althen v. Sec'y of Health & Human Servs.,* 418 F.3d 1274, 1278 (Fed. Cir. 2005): "(1) a medical theory causally connecting the vaccination and the injury; (2) a logical sequence of cause and effect showing that the vaccination was the reason for the injury; and (3) a showing of proximate temporal relationship between vaccination and injury." *Althen,* 418 F.3d at 1278.

Each of the *Althen* prongs requires a different showing. Under *Althen* prong one, petitioners must provide a "reputable medical theory," demonstrating that the vaccine received *can cause* the type of injury alleged. *Pafford*, 451 F.3d at 1355-56 (citations omitted). To satisfy this prong, a petitioner's theory must be based on a "sound and reliable medical or scientific explanation." *Knudsen v. Sec'y of Health & Human Servs.*, 35 F.3d 543, 548 (Fed. Cir. 1994). Such a theory must only be "legally probable, not medically or scientifically certain." *Id.* at 549.

Petitioners may satisfy the first *Althen* prong without resort to medical literature, epidemiological studies, demonstration of a specific mechanism, or a generally accepted medical theory. *Andreu v. Sec'y of Health & Human Servs.*, 569 F.3d 1367, 1378-79 (Fed. Cir. 2009) (citing *Capizzano*, 440 F.3d at 1325-26). Special masters, despite their expertise, are not empowered by statute to conclusively resolve what are essentially thorny scientific and medical questions, and thus scientific evidence offered to establish *Althen* prong one is viewed "not through the lens of the laboratorian, but instead from the vantage point of the Vaccine Act's preponderant evidence standard." *Id.* at 1380. Accordingly, special masters must take care not to increase the burden placed on petitioners in offering a scientific theory linking vaccine to injury. *Contreras v. Sec'y of Health & Human Servs.*, 121 Fed. Cl. 230, 245 (2015) ("[p]lausibility . . . in many cases *may* be enough to satisfy *Althen* prong one" (emphasis in original)), *vacated on other grounds,* 844 F.3d 1363 (Fed. Cir. 2017). But this does not negate or reduce a petitioner's ultimate burden to establish

his overall entitlement to damages by preponderant evidence. *W.C. v. Sec'y of Health & Human Servs.*, 704 F.3d 1352, 1356 (Fed. Cir. 2013) (citations omitted).[30]

The second *Althen* prong requires proof of a logical sequence of cause and effect, usually supported by facts derived from a petitioner's medical records. *Althen*, 418 F.3d at 1278; *Andreu*, 569 F.3d at 1375-77; *Capizzano*, 440 F.3d at 1326; *Grant v. Sec'y of Health & Human Servs.*, 956 F.2d 1144, 1148 (Fed. Cir. 1992). In establishing that a vaccine "did cause" injury, the opinions and views of the injured party's treating physicians are entitled to some weight. *Andreu*, 569 F.3d at 1367; *Capizzano*, 440 F.3d at 1326 ("medical records and medical opinion testimony are favored in vaccine cases, as treating physicians are likely to be in the best position to determine whether a 'logical sequence of cause and effect show[s] that the vaccination was the reason for the injury'") (quoting *Althen*, 418 F.3d at 1280). Medical records are generally viewed as particularly trustworthy evidence, since they are created contemporaneously with the treatment of the patient. *Cucuras v. Sec'y of Health & Human Servs.*, 993 F.2d 1525, 1528 (Fed. Cir. 1993).

However, medical records and/or statements of a treating physician's views do not *per se* bind the special master to adopt the conclusions of such an individual, even if they must be considered and carefully evaluated. Section 13(b)(1) (providing that "[a]ny such diagnosis, conclusion, judgment, test result, report, or summary shall not be binding on the special master or court"); *Snyder v. Sec'y of Health & Human Servs*., 88 Fed. Cl. 706, 746 n.67 (2009) ("there is nothing . . . that mandates that the testimony of a treating physician is sacrosanct – that it must be accepted in its entirety and cannot be rebutted"). As with expert testimony offered to establish a theory of causation, the opinions or diagnoses of treating physicians are only as trustworthy as the reasonableness of their suppositions or bases. The views of treating physicians should also be weighed against other, contrary evidence also present in the record – including conflicting opinions among such individuals. *Hibbard v. Sec'y of Health & Human Servs.*, 100 Fed. Cl. 742, 749 (2011) (not arbitrary or capricious for special master to weigh competing treating physicians' conclusions against each other), *aff'd*, 698 F.3d 1355 (Fed. Cir. 2012); *Caves v. Sec'y of Health & Human Servs.*, No. 06-522V, 2011 WL 1935813, at *17 (Fed. Cl. Spec. Mstr. Apr. 29, 2011), *mot. for*

[30] Although decisions like *Contreras* suggest that the burden of proof required to satisfy the first *Althen* prong is less stringent than the other two, there is ample contrary authority for the more straightforward proposition that when considering the first prong, the same preponderance standard used overall is also applied when evaluating if a reliable and plausible causal theory has been established. *Broekelschen v. Sec'y of Health & Human Servs*., 618 F.3d 1339, 1350 (Fed. Cir. 2010).

review den'd, 100 Fed. Cl. 344, 356 (2011), *aff'd without opinion*, 475 Fed. App'x 765 (Fed. Cir. 2012).

The third *Althen* prong requires establishing a "proximate temporal relationship" between the vaccination and the injury alleged. *Althen*, 418 F.3d at 1281. That term has been equated to the phrase "medically-acceptable temporal relationship." *Id.* A petitioner must offer "preponderant proof that the onset of symptoms occurred within a timeframe which, given the medical understanding of the disorder's etiology, it is medically acceptable to infer causation." *de Bazan v. Sec'y of Health & Human Servs.*, 539 F.3d 1347, 1352 (Fed. Cir. 2008). The explanation for what is a medically acceptable timeframe must also coincide with the theory of how the relevant vaccine can cause an injury (*Althen* prong one's requirement). *Id.* at 1352; *Shapiro v. Sec'y of Health & Human Servs.*, 101 Fed. Cl. 532, 542 (2011), *recons. den'd after remand*, 105 Fed. Cl. 353 (2012), *aff'd mem.*, 2013 WL 1896173 (Fed. Cir. 2013); *Koehn v. Sec'y of Health & Human Servs.*, No. 11-355V, 2013 WL 3214877 (Fed. Cl. Spec. Mstr. May 30, 2013), *mot. for review den'd* (Fed. Cl. Dec. 3, 2013), *aff'd*, 773 F.3d 1239 (Fed. Cir. 2014).

B. *Law Governing Analysis of Fact Evidence*

The process for making determinations in Vaccine Program cases regarding factual issues begins with consideration of the medical records. Section 11(c)(2). The special master is required to consider "all [] relevant medical and scientific evidence contained in the record," including "any diagnosis, conclusion, medical judgment, or autopsy or coroner's report which is contained in the record regarding the nature, causation, and aggravation of the petitioner's illness, disability, injury, condition, or death," as well as the "results of any diagnostic or evaluative test which are contained in the record and the summaries and conclusions." Section 13(b)(1)(A). The special master is then required to weigh the evidence presented, including contemporaneous medical records and testimony. *See Burns v. Sec'y of Health & Human Servs*., 3 F.3d 415, 417 (Fed. Cir. 1993) (it is within the special master's discretion to determine whether to afford greater weight to contemporaneous medical records than to other evidence, such as oral testimony surrounding the events in question that was given at a later date, provided that such determination is evidenced by a rational determination).

Medical records that are created contemporaneously with the events they describe are presumed to be accurate and "complete" (i.e., presenting all relevant information on a patient's

health problems). *Cucuras*, 993 F.2d at 1528; *Doe/70 v. Sec'y of Health & Human Servs.*, 95 Fed. Cl. 598, 608 (2010) ("[g]iven the inconsistencies between petitioner's testimony and his contemporaneous medical records, the special master's decision to rely on petitioner's medical records was rational and consistent with applicable law"), *aff'd*, *Rickett v. Sec'y of Health & Human Servs*., 468 F. App'x 952 (Fed. Cir. 2011) (non-precedential opinion). This presumption is based on the linked propositions that (i) sick people visit medical professionals; (ii) sick people honestly report their health problems to those professionals; and (iii) medical professionals record what they are told or observe when examining their patients in as accurate a manner as possible, so that they are aware of enough relevant facts to make appropriate treatment decisions. *Sanchez v. Sec'y of Health & Human Servs.*, No. 11-685V, 2013 WL 1880825, at *2 (Fed. Cl. Spec. Mstr. Apr. 10, 2013); *Cucuras v. Sec'y of Health & Human Servs.*, 26 Cl. Ct. 537, 543 (1992), *aff'd*, 993 F.2d at 1525 (Fed. Cir. 1993) ("[i]t strains reason to conclude that petitioners would fail to accurately report the onset of their daughter's symptoms.").

Accordingly, if the medical records are clear, consistent, and complete, then they should be afforded substantial weight. *Lowrie v. Sec'y of Health & Human Servs*., No. 03-1585V, 2005 WL 6117475, at *20 (Fed. Cl. Spec. Mstr. Dec. 12, 2005). Indeed, contemporaneous medical records are generally found to be deserving of greater evidentiary weight than oral testimony – especially where such testimony conflicts with the record evidence. *Cucuras*, 993 F.2d at 1528; *see also Murphy v. Sec'y of Health & Human Servs*., 23 Cl. Ct. 726, 733 (1991), *aff'd per curiam*, 968 F.2d 1226 (Fed. Cir. 1992), *cert. den'd*, *Murphy v. Sullivan*, 506 U.S. 974 (1992) (citing *United States v. United States Gypsum Co.*, 333 U.S. 364, 396 (1947) ("[i]t has generally been held that oral testimony which is in conflict with contemporaneous documents is entitled to little evidentiary weight.")).

However, there are situations in which compelling oral testimony may be more persuasive than written records, such as where records are deemed to be incomplete or inaccurate. *Campbell v. Sec'y of Health & Human Servs*., 69 Fed. Cl. 775, 779 (2006) ("like any norm based upon common sense and experience, this rule should not be treated as an absolute and must yield where the factual predicates for its application are weak or lacking"); *Lowrie*, 2005 WL 6117475, at *19 ("[w]ritten records which are, themselves, inconsistent, should be accorded less deference than those which are internally consistent") (quoting *Murphy*, 23 Cl. Ct. at 733)). Ultimately, a determination regarding a witness's credibility is needed when determining the weight that such

testimony should be afforded. *Andreu*, 569 F.3d at 1379; *Bradley v. Sec'y of Health & Human Servs*., 991 F.2d 1570, 1575 (Fed. Cir. 1993).

When witness testimony is offered to overcome the presumption of accuracy afforded to contemporaneous medical records, such testimony must be "consistent, clear, cogent, and compelling." *Sanchez*, 2013 WL 1880825, at *3 (citing *Blutstein v. Sec'y of Health & Human Servs*., No. 90-2808V, 1998 WL 408611, at *5 (Fed. Cl. Spec. Mstr. June 30, 1998)). In determining the accuracy and completeness of medical records, the Court of Federal Claims has listed four possible explanations for inconsistencies between contemporaneously created medical records and later testimony: (1) a person's failure to recount to the medical professional everything that happened during the relevant time period; (2) the medical professional's failure to document everything reported to her or him; (3) a person's faulty recollection of the events when presenting testimony; or (4) a person's purposeful recounting of symptoms that did not exist. *La Londe v. Sec'y of Health & Human Servs*., 110 Fed. Cl. 184, 203-04 (2013), *aff'd*, 746 F.3d 1334 (Fed. Cir. 2014). In making a determination regarding whether to afford greater weight to contemporaneous medical records or other evidence, such as testimony at hearing, there must be evidence that this decision was the result of a rational determination. *Burns*, 3 F.3d at 417.

C. *Analysis of Expert Testimony*

Establishing a sound and reliable medical theory often requires a petitioner to present expert testimony in support of his claim. *Lampe v. Sec'y of Health & Human Servs*., 219 F.3d 1357, 1361 (Fed. Cir. 2000). Vaccine Program expert testimony is usually evaluated according to the factors for analyzing scientific reliability set forth in *Daubert v. Merrell Dow Pharm., Inc.*, 509 U.S. 579, 594-96 (1993). *See Cedillo v. Sec'y of Health & Human Servs.*, 617 F.3d 1328, 1339 (Fed. Cir. 2010) (citing *Terran v. Sec'y of Health & Human Servs.*, 195 F.3d 1302, 1316 (Fed. Cir. 1999). "The *Daubert* factors for analyzing the reliability of testimony are: (1) whether a theory or technique can be (and has been) tested; (2) whether the theory or technique has been subjected to peer review and publication; (3) whether there is a known or potential rate of error and whether there are standards for controlling the error; and (4) whether the theory or technique enjoys general acceptance within a relevant scientific community." *Terran*, 195 F.3d at 1316 n.2 (citing *Daubert*, 509 U.S. at 592-95).

The *Daubert* factors play a slightly different role in Vaccine Program cases than they do when applied in other federal judicial for a (such as the district courts). *Daubert* factors are usually employed by judges (in the performance of their evidentiary gatekeeper roles) to exclude evidence that is unreliable and/or could confuse a jury. In Vaccine Program cases, by contrast, these factors are used in the *weighing* of the reliability of scientific evidence proffered. *Davis v. Sec'y of Health & Human Servs*., 94 Fed. Cl. 53, 66-67 (2010) ("uniquely in this Circuit, the *Daubert* factors have been employed also as an acceptable evidentiary-gauging tool with respect to persuasiveness of expert testimony already admitted"). The flexible use of the *Daubert* factors to evaluate the persuasiveness and reliability of expert testimony has routinely been upheld. *See, e.g.*, *Snyder*, 88 Fed. Cl. at 742-45. In this matter (as in numerous other Vaccine Program cases), *Daubert* has not been employed at the threshold, to determine what evidence should be admitted, but instead to determine whether expert testimony offered is reliable and/or persuasive.

Respondent frequently offers one or more experts of his own in order to rebut a petitioner's case. Where both sides offer expert testimony, a special master's decision may be "based on the credibility of the experts and the relative persuasiveness of their competing theories." *Broekelschen v. Sec'y of Health & Human Servs*., 618 F.3d 1339, 1347 (Fed. Cir. 2010) (citing *Lampe*, 219 F.3d at 1362). However, nothing requires the acceptance of an expert's conclusion "connected to existing data only by the *ipse dixit* of the expert," especially if "there is simply too great an analytical gap between the data and the opinion proffered." *Snyder*, 88 Fed. Cl. at 743 (quoting *Gen. Elec. Co. v. Joiner*, 522 U.S. 146 91997)); *see also Isaac v. Sec'y of Health & Human Servs*., No. 08-601V, 2012 WL 3609993, at *17 (Fed. Cl. Spec. Mstr. July 30, 2012), *mot. for review den'd*, 108 Fed. Cl. 743 (2013), *aff'd*, 540 Fed. App'x 999 (Fed. Cir. 2013) (citing *Cedillo*, 617 F.3d at 1339). Weighing the relative persuasiveness of competing expert testimony, based on a particular expert's credibility, is part of the overall reliability analysis to which special masters must subject expert testimony in Vaccine Program cases. *Moberly*, 592 F.3d at 1325-26 ("[a]ssessments as to the reliability of expert testimony often turn on credibility determinations"); *see also Porter v. Sec'y of Health & Human Servs*., 663 F.3d 1242, 1250 (Fed. Cir. 2011) ("this court has unambiguously explained that special masters are expected to consider the credibility of expert witnesses in evaluating petitions for compensation under the Vaccine Act").

D. *Consideration of Medical Literature*

Both parties filed medical and scientific literature in this case, with Petitioner for her part filing approximately 65 separate items. But not every filed article factors into the outcome of this decision. While I have reviewed all of the medical literature submitted in this case, I discuss only those articles that are most relevant to my determination and/or are central to Petitioner's case – just as I have not exhaustively discussed every individual medical record filed. *Moriarty v. Sec'y of Health & Human Servs.*, No. 2015-5072, 2016 WL 1358616, at *5 (Fed. Cir. Apr. 6, 2016) ("[w]e generally presume that a special master considered the relevant record evidence even though he does not explicitly reference such evidence in his decision") (citation omitted); *see also Paterek v. Sec'y of Health & Human Servs.,* 527 F. App'x 875, 884 (Fed. Cir. 2013) ("[f]inding certain information not relevant does not lead to – and likely undermines – the conclusion that it was not considered").

ANALYSIS

I. POTS and Orthostatic Intolerance

Although I have discussed above each expert's views on POTS and its nature and etiology, a few additional observations relevant to my disposition of this case are in order. First, POTS is unquestionably a *subset* of orthostatic intolerance – not something apart from it. *See* R. Freeman, et al., *Consensus Statement on the Definition of Orthostatic Hypotension, Neurally Mediated Syncope and the Postural Tachycardia Syndrome*, 21 Clin. Auton. Res. 69, 69-72 (2011), filed as Ex. L (ECF No. 78-9) ("Freeman"); B. Grubb, et al., *The Post Tachycardia Syndrome: A Concise Guide to Diagnosis and Management*, 17 J. Cardiovasc. Electrophysiol. 1, 1-5 (2006), filed as Ex. 50 (ECF No. 84-17) ("Grubb"). As a result, evidence relating to orthostatic intolerance conditions generally, as well as what can cause it, has relevance herein even if POTS is not directly implicated in that evidence.

Second, POTS is reflective of some kind of dysfunction in the autonomic nervous system (the passive arm of the overall nervous system), which literature filed in this case explains as an increase in heart rate caused by a change in body position from the supine position to the upright position. *See* Grubb at 1; Freeman at 4. In POTS, the "body's ability to recover from the initial

hemodynamic shift" resulting when an individual makes a positional, or orthostatic, change has been impacted in some way, leading to feelings of dizziness and lightheadedness plus other symptoms. Johnson at 78. Thus, a claimant alleging a vaccine injury of POTS is arguing that the relevant vaccine has done *something* to the autonomic system sufficient to cause this chronic response to orthostatic change. There should, therefore, be some evidence in this case that a vaccine could accomplish this – whether in general, or specifically with respect to the Petitioner herself.

II. Petitioner Has Not Satisfied her Burden of Proof

I am addressing the three *Althen* prongs in order of their importance to my decision, rather than in their numeric order.

A. *The Timeframe for Petitioner's POTS Onset was not Medically Acceptable* (*Althen Prong Three)*

In evaluating if Petitioner's alleged POTS began in a medically acceptable timeframe, I must first determine when the records suggest it most likely began. Based upon the medical record and the competing expert interpretations of it, I find that the record does not contain persuasive proof of symptoms that could be associated with POTS before November 2012 – 21 months after Petitioner's HPV vaccination. As Dr. Mack noted (based on his established record treating individuals with orthostatic problems like POTS), the February 2013 record of Petitioner's visit with Dr. Burris is the strongest evidence in the record of any time when she complained of enough POTS-associated symptoms (dizziness when standing up, weakness) that it could be reasonably concluded that she might have the condition. Because this record suggests this collection of symptoms had been ongoing for three months, onset can be placed in November 2012.

The record in the almost two-year period prior to that time, by contrast, is not suggestive of POTS. Rather, Ms. Johnson experienced either symptoms that are distinguishable (ptsosis), associated with an entirely different disease that she did not in fact suffer from (myasthenia gravis), or generalized symptoms, such as fatigue, that are too nonspecific to attribute to orthostatic intolerance. The symptoms that caused her to visit the doctor in March and May 2011 cannot credibly be deemed to be POTS-related, but instead reflect what the records say: that Petitioner

was suffering at the time from URIs of varying intensity, one severe enough to be diagnosed as bronchitis and to encourage treaters to perform a chest x-ray. These records do not reflect POTS symptoms - and Dr. Shoenfeld's strained efforts to argue that I should interpret them to the contrary, reading "cough" to mean "shortness of breath," when the latter was explicitly denied, were completely unpersuasive.

Taking the above into account, I can evaluate whether Petitioner's onset was medically appropriate. Petitioner's causation theory (assuming for the moment that it is reliable and/or supported by preponderant evidence) proposes that the HPV vaccine caused an autoimmune cross-reaction resulting in POTS. Dr. Mack allowed that the biologic process resulting in an autoimmune disease would occur within six months at most; Dr. Shoenfeld was far less constrained in proposing what a reasonable onset would be, but primarily maintained that Ms. Johnson's POTS began within two months of the vaccine's receipt – something my fact determination precludes. But this record does not even support the conclusion that six months from the date of receipt of the vaccine (or by August 2011) Ms. Johnson was experiencing any symptoms reflective of POTS. There is only medical record evidence suggesting that Petitioner might have been experiencing shortness of breath associated with strep throat (and thus another upper respiratory problem). Thus, the medical record would not support even Dr. Mack's admission for a possible maximum onset timeframe.[31]

Dr. Shoenfeld did not otherwise successfully establish that an even longer timeframe could be medically acceptable. First, I do not find persuasive his suggestions that POTS develops in a gradual or progressive manner (even though I do accept both experts' contention that it can be difficult to diagnose, and hence some delay from onset to diagnosis is to be expected), thereby allowing for a long temporal period in which symptoms accumulated. Dr. Mack was persuasive in establishing the contrary. Second, as I have stated in other cases in which Dr. Shoenfeld so argued, to allow virtually *any* amount of time that passes from vaccination to onset to be deemed medically appropriate would subvert the very purpose of this causation evidentiary element. *See, e.g., Garner v. Sec'y of Health & Human Servs.*, No. 15-063V, 2017 WL 1713184, at *16-17 (Fed. Cl. Spec.

[31] Mr. and Mrs. Johnson did provide unrebutted testimony that beginning in the summer of 2011 and then thereafter, they increasingly noticed that Petitioner exhibited greater and greater exercise intolerance. But without complaints of parallel symptoms more closely associated with POTS – most notably dizziness on standing up – and because I do not otherwise find that POTS would progress as argued, with symptoms building upon each other, I do not conclude that Petitioner's instances of exercise intolerance allow for an onset determination earlier than Dr. Mack's proposal.

Mstr. Mar. 24, 2017), *mot. for review den'd,* 133 Fed. Cl. 140 (2017); *see also Hennessey v. Sec'y of Health & Human Servs.*, 91 Fed. Cl. 126, 142 (2010) (rejecting Dr. Shoenfeld's attempt to satisfy the third prong by positing that any timeframe is appropriate). Yet Dr. Shoenfeld implied this is his actual view. Tr. at 32-33. This position lacks sufficient scientific support for it to be deemed reliable, and therefore it does not aid Petitioner herein in arguing that the timeframe for her onset was medically appropriate.

B. *Petitioner Has Not Offered a Reliable Causation Theory (Althen Prong One)*

As noted above, Petitioner has offered extensive amounts of medical and scientific literature to support her claim, and also employed an expert with a strong background in autoimmune and immunologic matters. And she includes components within her theory that are routinely deemed valid in Vaccine Program cases, such as the mechanism of molecular mimicry to explain how the protein components of a vaccine could cause an autoimmune cross-reaction. Nevertheless, I do not find that the theory proposed in this case is sufficiently reliable, or bulwarked in crucial places by reliable evidence, to find in turn that it has been established by preponderant evidence.

First, Petitioner has not offered adequate evidence supporting the contention that any association exists generally between the HPV vaccine and POTS. She relies heavily on articles involving case studies in which a temporal correlation was observed between receipt of the HPV vaccine and POTS, or comparable kinds of orthostatic intolerance. *See, e.g.,* Ozawa; Kinoshita; Brinth; Blitshteyn. But it is well recognized in the Program that while case studies are *evidence* that should be considered as part of a special master's overall entitlement determination, they are not necessarily *probative* of causation, and for that reason do not in most instances merit significant weight. *See R.V. v. Sec'y of Health & Human Servs*., No. 11-504V, 2016 WL 3882519, at *41 (Fed. Cl. Spec. Mstr. Feb. 19, 2016) ("individual patient case reports . . . are not, in general, strong evidence of causation") (internal quotation marks omitted), *mot. for rev. denied*, 127 Fed. Cl. 136 (2016). Dr. Mack convincingly explained in particular why many of the items of literature that relied on such case study data were untrustworthy – the studied subjects voluntarily had sought treatment for their orthostatic symptoms, making the studied group too self-selected to draw conclusions from correlations observed with respect to that population. *See Evanson v. Sec'y of*

Health & Human Servs., No. 90-775V, 1991 WL 179085, at *4 (Fed. Cl. Spec. Mstr. Aug. 28, 1991) (suggesting "major methodological problems" exist with studies relying on self-reporting). He also reasonably proposed that any association observed between HPV vaccine recipients and POTS was attributable to the fact that young women were both the population most likely to develop POTS *and* the population most likely to receive the HPV vaccine – rendering any association between the two (not otherwise supported by a proper scientific experiment with reliable controls) the product of chance.

Dr. Shoenfeld's personal expertise could not fill in this evidentiary gap. He has written extensively on the pathologic capacities of different vaccines, but has not been shown to possess particularized knowledge of the autonomic nervous system or orthostatic intolerance conditions, whether from a clinical practice or research. I listened to his testimony and, given his demonstrated immunologic credentials, considered it carefully – but I did not find it to be credible simply because it came out of his mouth.[32]

The alleged autoimmune nature of POTS is also a notably deficient element of Petitioner's case. Here – as in many vaccine injury claims – the Petitioner seeks to establish that the implicated vaccine has initiated an injurious autoimmune process. It is undeniable that autoimmune diseases have been associated with many vaccines, and many severe or alarming symptoms are attributable to, or associated with, autoimmune diseases. *See, e.g.*, *Lozano v. Sec'y of Health & Human Servs.*, No. 15-369V, 2017 WL 3811124 (Fed. Cl. Spec. Mstr. Aug. 4, 2017). But the Petitioner cannot prevail simply by arguing that *other* petitioners successfully established that the disease or condition they experienced has been shown to be autoimmune, and therefore the same is plausible here.

The evidence that POTS is in all instances, or even the majority of instances, autoimmune was fairly thin. Petitioner did have Dr. Shoenfeld's support for the contention, and his expertise in studying autoimmunity entitles his opinion to some weight (although that opinion was simultaneously undermined by his *lack* of experience studying or treating POTS). In addition, Dr.

[32] In other Program cases, Dr. Shoenfeld has advanced the broad opinion that virtually *any* autoimmune illness or disease could be vaccine-caused – a sweeping view that lacks reliability, at least based on present science. *See, e.g.*, *Hennessey v. Sec'y of Health & Human Servs*., 91 Fed. Cl. 126, 135 (2010) (rejecting Dr. Shoenfeld's theory that "every vaccine can potentially cause an autoimmune disease" as "so broad as to be meaningless") (internal quotation marks omitted)).

Mack did not categorically deny that POTS could *ever* be autoimmune in nature. However, the circumstances in which the condition *might* be autoimmune appear extremely limited - i.e., where an individual possesses a specific ganglionic autoantibody - are inapplicable in this case (as Petitioner was not shown to possess that autoantibody), and otherwise have not been shown applicable to the form of POTS suffered in this case. The literature filed in the case better supports the conclusion that POTS is more commonly *not* autoimmune in origin.[33]

In addition, Dr. Mack referenced reliable and credible epidemiologic evidence, like Chao, that further weakened Petitioner's contention that the HPV vaccine has been associated with *any* autoimmune illnesses. I have often had the occasion to consider Chao in cases involving the HPV vaccine, and I deem it a probative, persuasive piece of evidence that is not diminished in reliability merely because it was funded in part by a pharmaceutical company. *See Sullivan v. Sec'y of Health & Human Servs.*, No. 10-398V, 2015 WL 1404957, at *11-12 (Fed. Cl. Spec. Mstr. Feb. 13, 2015). While it is true that petitioners are not obligated to offer epidemiologic evidence to support their claim, it can be considered (especially when it exists and is especially relevant to the causal theory at issue) in evaluating the success of a Vaccine Act petitioner in meeting her evidentiary burden.[34] Here, such evidence was not effectively rebutted.

[33] I also note that some of the foundational support for the contention that POTS can be autoimmune has been called into question. In a recent Vaccine Program matter before me also involving POTS and the HPV vaccine, one of Dr. Mack's Mayo Clinic colleagues, Dr. Philip Low – a neurologist with a deep background in autonomic disease, and a foremost authority on the topic as well as orthostatic intolerance more generally – testified as an expert. In so doing, Dr. Low spoke about Thieben (which he co-authored), and the views expressed therein regarding the possibility of an autoimmune association for some cases of POTS. *See Combs v. Sec'y of Health and Human Servs.*, No. 14-878, slip. op. (Fed. Cl. Spec. Mstr. Feb. 15, 2018). Dr. Low opined that the association (based on the same ganglionic autoantibodies testified to by Dr. Shoenfeld) had not been borne out by subsequent research, and in fact he regretted it had even been mentioned in Thieben (an article cited by Petitioner and which many of the other items of literature she cited relies upon), since it misled treaters into placing undue emphasis on testing for the presence of the autoantibody when evaluating POTS. Combs at 17-18.

[34] Petitioners in Program cases, when confronted with strong epidemiologic evidence, are often quick to retort that they cannot be "required" to offer it as part of their evidentiary showing – and therefore merely to consider it constitutes an unfair heightening of their evidentiary burden. *See D'Toile v. Sec'y of Health & Human Servs.*, 132 Fed. Cl. 421, 430 (2017), *appeal docketed*, No. 17-1982 (Fed. Cir. May 4, 2017). But this conflates what evidence a petitioner must *offer* to prevail with what a petitioner must do in *rebutting* such evidence - when it exists. Petitioners can obtain entitlement without ever resorting to epidemiologic evidence, and there are many circumstances where that category of evidence could be shown as not deserving of substantial weight (for example, epidemiologic evidence that the flu vaccine is mostly safe would not rebut equally reliable scientific evidence that the flu vaccine has been associated with rare illnesses, like certain peripheral neuropathies). But sound and reliable epidemiologic evidence that bears on a vaccine injury claim cannot be swept under the carpet with the argument that it is categorically irrelevant.

Moreover, even if I found that the autoimmune character of POTS had been established in limited circumstances, Dr. Shoenfeld's overall opinion remains unreliable from a scientific and medical standpoint. Dr. Shoenfeld repeatedly made clear that his causation opinion also depended on additional points: (a) theoretical homology between components of the HPV vaccine for molecular mimicry to be a reasonable mechanism explaining how the HPV vaccine could cause an autoimmune reaction resulting in POTS, (b) the existence of a positive ANA titer level as indicating a susceptibility to autoimmune conditions, and (c) the fact that Petitioner ultimately received a POTS diagnosis. Tr. at 40-41, 133-34. But each of these additional points was inadequately established, in different ways.

Regarding homology and molecular mimicry, I acknowledge that claimants need not establish a specific biologic mechanism to prevail, and also that the mechanism of molecular mimicry has been accepted in numerous Program cases to explain how an autoimmune process can work. Nevertheless – Petitioners cannot simply invoke the concept of molecular mimicry and call it a day. *See Devonshire v. Sec'y of Health & Human Servs.*, No. 99-031V, 2006 WL 2970418, at *15 (Fed. Cl. Spec. Mstr. Sept. 2006), *aff'd*, 76 Fed. Cl. 452 (2007). Rather, they need to offer *reliable* and *persuasive* medical or scientific evidence of some kind (whether expert testimony or literature) that suggests the vaccine components could interact with self structures as maintained. Here, all Petitioner has done is observe that protein sequences contained in the HPV vaccine can be shown to possess some sequential and/or structural similarity with proposed targets of where the autoimmune reaction resulting in POTS is speculated to occur – *not* evidence that (a) the HPV vaccine has been established to so perform, or (b) that reliable science has demonstrated that *any* kind of external insult, whether viral or vaccine, would produce a reaction resulting in POTS at the proposed locus. Tr. at 136-38. There is thus a missing, but vital, link to this aspect of Petitioner's theory.

The existence of a somewhat positive ANA level is an even more attenuated consideration in favor of Petitioner's causation theory. Dr. Shoenfeld himself admitted that it alone was not strong evidence supporting his theory. Tr. at 41. But ANA levels are not even *directly associated* with POTS – and the autoantibodies that arguably are, such as the ganglionic antibodies referenced in Thieben, were never detected in this case. Rather, as Dr. Mack established, ANA levels are most directly relevant to whether an individual has a rheumatologic disease, like lupus – a disease not

at issue herein. And individuals can possess positive ANA titers and not experience an autoimmune disease. In effect, Dr. Shoenfeld is conflating *all* autoimmune conditions, and the biomarkers associated therewith, as comparable and interchangeable.[35]

Finally, Dr. Shoenfeld's theory, by his own admission, was heavily dependent on the mere fact of Petitioner's diagnosis. This, however, is the definition of the kind of circular reasoning – injury being cited as proof that the vaccine could cause that injury – that has often been rejected in other cases. *See, e.g.*, *Holmes v. Sec'y of Health & Human Servs.*, No. 08-185V, 2011 WL 2600612, at *14 (Fed. Cl. Spec. Mstr. Apr. 26, 2011), *aff'd*, 115 Fed. Cl. 469 (2014). It is no more persuasive here.

C. *Petitioner Has Not Demonstrated her POTS was Vaccine-Caused (Althen Prong Two)*

A threshold question presented under the "did cause" *Althen* analysis is whether Ms. Johnson had POTS at all. Although Dr. Mack disputes the diagnosis, I find that it is supported by preponderant evidence. Dr. Blitshteyn is a qualified neurologist with an interest in POTS (at least as reflected in her publications) comparable to that of Dr. Mack. Although she did not formally so diagnose Petitioner, she strongly suggested a POTS diagnosis would be appropriate, and she did so on the basis of several years of medical records. What is more, the results of the tilt table test that I requested Petitioner undergo were mostly supportive of the diagnosis, Dr. Mack's criticisms notwithstanding. Although a more reliable and complete diagnosis might be preferable (for example, one made by a treater who saw Ms. Johnson in person, and closer in time to when the symptoms began), the diagnosis herein has enough evidentiary support to find that it meets the preponderance test.

The overall record does *not*, however, contain preponderant evidence that the HPV vaccine

[35] Dr. Shoenfeld also could not help but allude to the ASIA theory in arguing for the importance of the vaccine adjuvant in inducing the alleged autoimmune reaction. *See, e.g.*, Tr. at 19-20 ("[t]he adjuvant, per se, in someone who is at risk of developing autoimmune disease, can induce autoimmunity"). I had previously warned Dr. Shoenfeld to steer clear of this as a component of his causation theory, and for good reason: similar ASIA theories have repeatedly been found to be unpersuasive by other special masters, because the theory is (at a minimum) too preliminary or unreliable based on present science. *See, e.g.*, *Rowan v. Sec'y of Health & Human Servs.*, No. 10-272V, 2014 WL 7465661 (Fed. Cl. Spec. Mstr. Dec. 8, 2014); *mot. for review den'd*, 2015 WL 3562409 (Fed. Cl. 2015); *D'Angiolini v. Sec'y of Health & Human Servs.*, No 99-578V, 2014 WL 1678145 (Fed. Cl. Spec. Mstr. Mar. 27, 2014), *mot. for review den'd*, 122 Fed. Cl. 86 (2015).

caused Petitioner's POTS via the proposed autoimmune process. The medical record does not support the conclusion that the HPV vaccine had any deleterious effect on Ms. Johnson within even eighteen months of receipt. Rather, she had several URIs with associated symptoms that later resolved, or unrelated problems (ptosis, suspected myasthenia gravis) that are not reasonably linked to her subsequent POTS diagnosis. There is certainly little evidence in 2011 or 2012 that Petitioner was experiencing any of the hallmarks of an autoimmune disease, like inflammation, and the fact that she was positive for certain autoimmune markers (for example, her slightly elevated ANA levels) cannot be leveraged into a finding that she was beginning to experience POTS – especially since she has not been shown to possess the autoantibodies that (at least at one time) have been deemed to be potentially associated with POTS. And the anecdotal evidence that Petitioner's family members had experienced autoimmune illnesses, and/or that Petitioner herself was at certain points considered to be experiencing one (myasthenia gravis in particular) does not establish preponderant proof that she did actually have some genetic risk (and indeed Dr. Shoenfeld admitted he could not even identify what the relevant genetic marker might be for POTS (Tr. at 135)). Thus, even if Dr. Blitshteyn's 2015 diagnosis is unassailable, the evidence of Petitioner's course from February 2011 to the time she first displayed POTS-related symptoms in late 2012 does not reflect a vaccine-induced condition.

Dr. Shoenfeld's testimony in interpreting Petitioner's medical records on these matters was especially unpersuasive. He repeatedly argued with treater findings, attempting to twist self-evident record notations (such as the fact that the Petitioner reported she had a cough in March 2011) into evidence of "shortness of breath" that was in fact a harbinger of POTS. Although experts can successfully dispute the accuracy of treater notes, or provide persuasive alternative interpretations based on facts gleaned from contemporaneous records or their own experience, Dr. Shoenfeld's argumentative approach was ineffective. He was also unsuccessful in proposing that POTS was a progressive condition that would unfold over time, as allegedly occurred in Petitioner's circumstances. Although ample evidence offered in this case supports the conclusion that it can take treaters some time to diagnose POTS, Dr. Mack was more persuasive in explaining that POTS does not unfold or develop progressively. If Petitioner had been suffering from POTS as early as she alleges, the record should have more evidence of symptoms classically associated with it – but it does not.

Overall, the medical record and other evidence does not preponderate in favor of the conclusion that (assuming POTS is autoimmune in Petitioner's case) the HPV vaccine had anything more than a remote temporal association with the onset of her POTS-associated symptoms – not enough for entitlement.

CONCLUSION

The Johnson family's demonstrated efforts to identify a cause for Petitioner's condition, and to take the best care of her possible, are laudable. But the record does not support Petitioner's contention that the HPV vaccine caused her to develop POTS, and the expert support offered for her claim was deficient. Petitioner has therefore not established entitlement to a damages award, and I must DISMISS her claim.

In the absence of a timely-filed motion for review (see Appendix B to the Rules of the Court), the Clerk shall enter judgment in accordance with this decision.[36]

IT IS SO ORDERED.

/s/ Brian H. Corcoran
Brian H. Corcoran
Special Master

[36] Pursuant to Vaccine Rule 11(a), the parties may expedite entry of judgment by filing a joint notice renouncing their right to seek review.